53
7
557

PHYSICS ABSTRACTS

BEING

SCIENCE ABSTRACTS—SECTION A

EDITED AND ISSUED MONTHLY BY
THE INSTITUTION OF ELECTRICAL ENGINEERS
IN ASSOCIATION WITH
THE PHYSICAL SOCIETY
THE AMERICAN PHYSICAL SOCIETY
THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

ERSITY LIBRARY

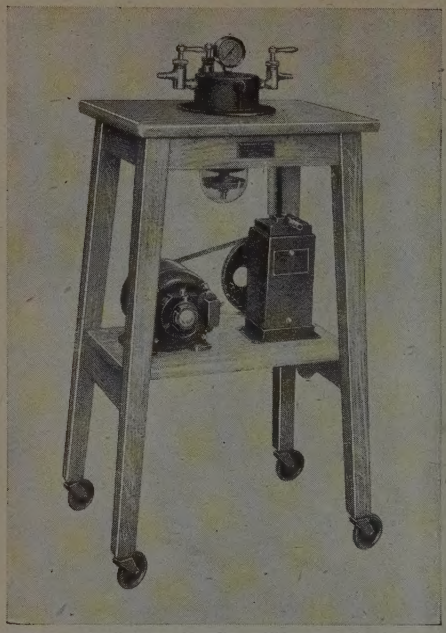
Price, Single Numbers, 3s. 6d.
Annual Subscription, 35s., including the Yearly Index.
Annual Subscription, for both Sections, 60s.

Copyright.

ABSTRACTS 987–1211

Vol. 47 MAY, 1944 No. 557

MOBILE PUMPING UNITS FOR VACUUM OR PRESSURE



These units, which supply a high vacuum or moderate pressure from several points, were originally introduced by us to meet certain needs for small-scale vacuum or pressure work. Improvements have been made as a result of experience gained and the latest types are the most efficient and inexpensive available. They are always ready for working, do not obstruct bench space and can be wheeled to any convenient corner after use. Different pumps can be fitted according to individual needs.

Write for details

W. EDWARDS & CO. (London) LTD.

Makers of apparatus for the Production, Utilization and Measurement of High Vacuum

KANGLEY BRIDGE ROAD, LOWER SYDENHAM, LONDON, S.E.26

'Phone: SYDenham 7026 'Grams: Edcohivac, Phone, London

CONTENTS—ABSTRACTS 987–1211

		Page
159	Psychology	89
165	Theories of knowledge	89
51	Mathematics	89
52	Astronomy	91
523.7	Sun	91
523.8	Stars	91
53	Physics	91
530	General principles	91
531	Mechanics	92
531.7	Measurements	93
532	Liquids	93
532.13	Viscosity	93
532.14	Density	93
532.5	Hydrodynamics	93
532.6	Surface tension	94
532.7	Osmosis. Solution	94
533	Gases	94
533.7	Kinetic theory	94
534	Acoustics. Vibrations	94
535	Optics. Radiation	95
535.24	Photometry	95
535.3	Reflection. Refraction	96
535.33	Spectroscopy	96
535.336.2	Mass spectra	96
535.338	Spectra	96
535.34	Absorption	97
535.37	Fluorescence. Luminescence	97
535.375.5	Raman effect	97
535.4	Diffraction. Scattering. Interference	98
535.5	Polarization	98
535.6	Colour	98
535.7	Vision	99
535.8	Optical glass	99
535.82	Instruments	99
536	Heat	99
536.7	Thermodynamics	99
537	Electricity	99
537.5	Electric discharge	100
537.533	Electron radiation	100
537.534	Positive rays	101
537.56	Ionization of gases	101
537.58	Thermionization	101
537.59	Cosmic rays	101
538	Magnetism. Electromagnetism	102
539.1	Kinetic theory of solids	102
539.13	Molecules	102
539.15	Atoms	102
539.16	Radioactivity	103
539.185	Neutrons	103
539.2	Molecular systems	103
539.26	X-ray examination	104
539.3	Elasticity. Deformation	104
539.4	Strength of materials	105
539.5	Deformability	105
539.6	Friction. Cohesion	106
54	Chemistry	106
541.12	Reaction kinetics	106
541.128	Catalysis	106
541.13	Electrochemistry	106
541.14	Photochemistry	106
541.18	Colloids. Adsorption	106
541.5	Valency. Bonds	107
541.6	Chemical structure	107
543/545	Analysis	107
546	Inorganic chemistry	107
547	Organic chemistry	107
548	Crystallography	107
549	Mineralogy	108
55	Geophysics	108
551.5	Meteorology	108
553	Quartz	108
576.1	Phylogeny	108
576.3	Cytology	108
576.8	Bacteriology	108
578	Biological technique	108
591	General zoology	108
620	Testing of materials	108
621.9	Machine tools	108
629.12	Ships	108
629.135	Aircraft	108
63	Agriculture	108
632.94	Pest control	108
662	Fuel	108
666	Glass. Ceramics	108
669	Metallurgy	108
676	Paper	108
677	Textiles	108
678	Rubber	108
744	Drawing instruments	108
78	Music	108

Abstracts signed "E. R. A." are supplied by courtesy of the British Electrical and Allied Industries Research Association. Abstracts signed "M.-V." are supplied by courtesy of the Metropolitan-Vickers Electrical Co. Ltd.

159.94 : 517.948.34 *see Abstr.* 1004

165 : 530.1 987

Outline of an empiricist philosophy of physics. BERGMANN, G. *Amer. J. Phys.*, 11, *pp.* 248–258, *Oct., and pp.* 335–342, *Dec.*, 1943.—A discussion of scientific method as applied to the exposition of physical problems, covering the concept formation, the nature of empirical laws, and theory structure. It is comparable to an earlier paper which gave a similar exposition for the problems that arise in connection with the concept of probability [Abstr. 8 (1942)]. A. E. T.

51 : 576.1 988

On the origin of life. RASHEVSKY, N. *Bull. Math. Biophys.*, 5, *pp.* 165–169, *Dec.*, 1943.—Starting with the recently proposed fundamental equation of mathematical biophysics [Abstr. 2280, 2290 (1943)] a suggestion is made for a theory of the formation of a primitive cell from non-living matter. The discussion includes a quantitative formulation of the degree of biological organization. It is shown that organization of non-living material may spontaneously increase under certain conditions to form a primitive organism. The process is, however, a very slow one, requiring time intervals of several years. This may account for the failure in observing or artificially producing spontaneous generation. L. S. G.

51 : 591.18 989

A logical calculus of the ideas immanent in nervous activity. MCCULLOCH, W. S., AND PITTS, W. *Bull. Math. Biophys.*, 5, *pp.* 115–133, *Dec.*, 1943.—An application is made of the symbolic logic of propositions to the treatment of neural events and the relations between them. This is possible because of the "all-or-none" character of nervous activity. Every nervous net can be treated in this way, with the addition of more complicated logical means for nets containing circles (a circle is a closed chain of neurons, each member of the chain synapsing upon the next). A net can be associated with any logical expression satisfying certain conditions. It is shown that different neurophysiological assumptions are equivalent in the sense that for each net behaving under one assumption, there exists another net which behaves under the other and gives the same result, although perhaps not in the same time. L. S. G.

511.91 990

A note on Farey series. ERDÖS, P. *Quart. J. Math.*, 14, *pp.* 82–85, *Dec.*, 1943.—A proof is given of an extension of a theorem of Mayer on the ordering of Farey series: There exists an abs. const. C such that, if $n > Ck$ and if $a_1/b_1, a_2/b_2 \ldots$, are the Farey fractions of order n, then a_x/b_x and a_{x+k}/b_{x+k} are similarly ordered. L. S. G.

512.26 : 535.317.6 *see Abstr.* 1072

512.3 : 576.35 991

Note on Rashevsky's equation for cellular growth. HOUSEHOLDER, A. S. *Bull. Math. Biophys.*, 5, *pp.* 161–163, *Dec.*, 1943.—The equation for growth by intussusception involves the product x of the internal concentration of n metabolites. It is shown that x satisfies the equation $x = \prod_{i=1}^{n} (1 - x/\alpha_i)$ where $\alpha_1, \ldots, \alpha_n$ are positive and $\alpha_1 \leqslant \alpha_2 \leqslant \ldots \leqslant \alpha_n$. An approx. value of the smallest root ξ is given by $1/(1 + n/\alpha) \leqslant \xi \leqslant 1/(1 + 1/\alpha_1)$, where α is the harmonic mean of $\alpha_1, \ldots, \alpha_n$. L. S. G.

512.97 : 530.145.6 *see Abstr.* 1018

513.624 : 513.821.2 *see Abstr.* 993

513.735 : 513.738 992

New proofs of the theorems of Beltrami and Kasner on linear families. CICCO, J. DE. *Bull. Amer. Math. Soc.*, 49, *pp.* 407–412, *June*, 1943.—The theorems proved are (i) (Beltrami) a surface S may be mapped upon a plane π so that its geodesics correspond to straight lines if and only if S is of const. Gaussian curvature, (ii) (Kasner) a complete system of isogonal trajectories of a one-parameter family of curves F is linear if and only if F is isothermal, (iii) (Kasner) a surface S can possess exactly ∞^2 isothermal families of geodesics if and only if S is of const. Gaussian curvature. The proofs involve the consideration of certain classes of ∞^2 curves, namely velocity systems, natural families, isogonal systems, Γ_0 and Γ families. [See Abstr. 1446 (1942)]. L. S. G.

513.738 : 513.735 *see Abstr.* 992

513.821.2 : 513.624 993

On mutually self-polar simplexes. HAMEED, A. *Bull. Calcutta Math. Soc.*, 35, *pp.* 43–53, *June*, 1943.—A generalization in $[n]$ of the properties of mutually self-polar tetrahedra [Abstr. 2220 (1942)]. By considering the case $n = 4$, a quartic surface in $[3]$ is derived having 10 double points, which arrange themselves in a 3-dimensional 10_3 configuration of Desargue. The 10 lines of the configuration also lie on the surface, which has for its equation $\sum_{i=0}^{3} 1/x_i = 1 \Big/ \sum_{i=0}^{3} x_i$. L. S. G.

517.514 : 517.947.44 *see Abstr.* 1002

517.544.2 : 517.77 : 537.212 : 621.315.21 994

Field concentration near circular conductors. PORITSKY, H. *Bull. Amer. Math. Soc.*, 49, *pp.* 417–421, *June*, 1943.—Consider an infinite number of equal cylindrical conductors having their axes all parallel and in the same plane $\tilde{\omega}$ such that each cylinder touches the adjacent pair. The cylinders are all at a const. potential, and at a great distance from $\tilde{\omega}$ there is a parallel plane $\tilde{\omega}'$ at a different potential. The problem is the calculation of the max. field concentration, assuming that $\tilde{\omega}$ and $\tilde{\omega}'$ are so far apart that the field near $\tilde{\omega}'$ is quite uniform. The solution is obtained by means of a conformal mapping utilizing the modular function $\lambda(\tau) = 16q(1+q^{1\cdot 2}+q^{2\cdot 3}+\ldots)^4/(1 + 2q + 2q^4 + 2q^9 + \ldots)^4$ where $q = e^{\tau\pi i}$, the τ-plane being related to the original Z-plane by the relation $Z = \tau\pi/2$. The actual transformation used is $w = (1/2)\log(\lambda - 1)/\lambda$, and the field concentration factor is found to be 1·3952. The problem is of interest in the construction of a type of electric cable. L. S. G.

517.564 : 517.948.32 *see Abstr.* 1003

517.564.3 995

Some infinite integrals involving Bessel functions of imaginary argument. SINHA, S. *Bull. Calcutta Math. Soc.*, 35, *pp.* 37–42, *June*, 1943.—The integral evaluated is $\int_0^\infty x^{\rho-1}K_\lambda(ax)K_\mu(ax)\,{}_pF_q(a_1,\ldots,a_p;b_1,\ldots,b_q;bx^2)dx$, where ${}_pF_q(a_1,\ldots,a_p;b_1,\ldots,b_q;bx^2)$ is the generalized hypergeometric functions. Some special cases are discussed. L. S. G.

517.564.4 996

Associated Legendre functions of the first kind when the sum of the degree and the order is a positive integer. MACROBERT, T. M. *Quart. J. Math.*, 14, *pp.* 1–4, *June*, 1943.—Series expansions (finite) are given for the functions $T^{-m}_{m+n}(\cos\theta)$ and $P^{-m}_{m+n}(\cos\theta)$, the former being a series of cosines of multiples of θ and the latter a series of powers of $\cos\theta$. The determinant, of order $n+1$, whose $(i,j)^{th}$ element is $T^{-m}_{m+i+j}(\cos\theta)$ $(i,j=0,1,\ldots,n)$ is shown to be a constant multiple of $(\sin\theta)^{(m+n)(n+1)}$ L. S. G.

517.566.3 997

Some properties of the Riemann zeta function. TITCHMARSH, E. C. *Quart. J. Math.*, 14, *pp.* 16–26, *June*, 1943.—Formulae are obtained, based on the Riemann hypothesis, for $\zeta'(s)/\zeta(s)$ and $\log\zeta(s)$. These are improvements on known approx. formulae. The function $M(x)=\sum_{n\leqslant x}\mu(n)$, where $\mu(n)$ is the Möbius function, is also treated and there are sections dealing with the order and the average order of $M(x)$. L. S. G.

517.65 998

A note on Hilbert transforms. KOBER, H. *Quart. J. Math.*, 14, *pp.* 49–54, *Dec.*, 1943.—A new method based upon the approximation to integrable functions by rational functions, is given to prove some theorems regarding the existence and properties of Hilbert transforms. Some new results on the characteristic functions are also given. L. S. G.

517.77 : 537.212 : 621.315.21 : 517.544.2
see Abstr. 994

517.92 : 576.8.094 999

On synchronous sporulation with possible reference to malarial parasites. HOUSEHOLDER, A. S. *Bull. Math. Biophys.*, 5, *pp.* 149–154, *Dec.*, 1943.—On the assumption that a metabolite which is essential to the growth of the parasite is periodically released from storage organs and dissipated from the blood stream of the host, it is shown that sporulation may be synchronous, as in the case of the malarial parasite. Mathematically, the paper begins with Rashevsky's growth equation in the form $2rdr/dt=a'e^{-\alpha t}-\beta r^2$, and the solution of this, subject to suitable conditions on the parameters, leads to the result indicated. L. S. G.

517.942.6 1000

An extension of hypergeometric functions. I. CHAUNDY, T. W. *Quart. J. Math.*, 14, *pp.* 55–78; *Dec.*, 1943.—If, in the function ${}_rF_s(a_1,\ldots,a_r,c_1,\ldots,c_s;x)$, one of the parameters a is a neg. integer $-n$ and $x=1$, the function may reduce, under suitable conditions on the remaining parameters, to a product $(A_1)_n(A_2)_n\ldots/(B_1)_n(B_2)_n\ldots$, where $(A)_n=\Gamma(A+n)/\Gamma(A)$. Such a product is called a gamma product, and the function ${}_rF_s$ is said to be reducible. If F_n is a reducible function, the infinite series $y=\sum\gamma_nF_nx^n/n!$, where γ_n is a gamma product, is a hypergeometric function. The present paper considers such series when F_n is no longer reducible, in particular when F_n just fails to be reducible, i.e. when the resulting recurrence relations satisfied by F_n and the differential equation satisfied by y are of rank 2. L. S. G.

517.947.43 : 536.2 1001

Heat conduction in an infinite composite solid. MERSMAN, W. A. *Bull. Amer. Math. Soc.*, 47, *pp.* 956–964, *Dec.*, 1941.—Two plane-boundary semi-infinite solids are placed in perfect thermal contact and conduction of heat takes place only in the direction perpendicular to the interface. The temperature $U(x,t)$ satisfies the equations $\partial U/\partial t=a_i\partial^2U/\partial x^2$; $t>0$; $x<0$, $i=1$; $x>0$, $i=2$, subject to the boundary conditions $\lim_{t\to 0}U(x,t)=f(x)$, $x\neq 0$ $\lim_{x\to -0}U(x,t)=\lim_{x\to +0}U(x,t)$, $t>0$ $\lim_{x\to -0}K_1\partial U/\partial x=\lim_{x\to +0}k_2\partial U/\partial x$, $t>0$ where a_i, $k_i(i=1,2)$ are pos. constants. The solution is obtained formally by means of the Laplace transformation and is then rigorously established. Finally, a uniqueness theorem is proved under some restrictive conditions on the initial distribution function $f(x)$. L. S. G.

517.947.44 : 517.514 1002

On expansion in eigenfunctions of boundary-value problems. VI. MINAKSHISUNDARAM, S. *Bull. Calcutta Math. Soc.*, 35, *pp.* 81–84, *June*, 1943.—An extension to a space of m dimensions $(m\geqslant 2)$ of results obtained in previous papers [Abstr. 2240 (1941)]. L. S. G.

517.948.32 : 517.564 1003

Some self-reciprocal functions. GUPTA, H. C. *Bull. Calcutta Math. Soc.*, 35, *pp.* 67–70, *June*, 1943.—Known kernels [Abstr. 1445 (1942)] are used to investigate some new R_ν functions (i.e. functions which are self-reciprocal in the Hankel Transform of order ν) which are in the form of generalized hypergeometric functions ${}_2F_2$. L. S. G.

517.948.34 : 159.94 1004

A mathematical theory of the affective psychoses. LETTVIN, J. Y., AND PITTS, W. *Bull. Math. Biophys.*, 5, *pp.* 139–148, *Dec.*, 1943.—A theory is developed of a certain group of mental disorders. The course of the disease may be described in terms of two variables ϕ and ψ, the first representing the level of feeling, affect, or emotion in the organism, and the other the level of activity or conation. The variation of ϕ and ψ with time is governed by the integro-differential equations

$$d\phi/dt=\beta\int_0^t\phi(\eta)e^{-\mu(t-\eta)}\{\phi(\eta)-\varepsilon_1\psi(\eta)\}d\eta+M(t)-f\{\phi(t)\}$$

$$d\psi/dt=\beta\int_0^t\phi(\eta)e^{-\mu(t-\eta)}\{\psi(\eta)-\varepsilon_2\phi(\eta)\}d\eta+\overline{M}(t)-f\{\phi(t)\}$$

The solutions represent quantitative specifications of different psychotic states, since an increase of ψ results in a transition from stupor to manic excitement and for increasing values of ϕ the conduct of the organism varies from great impassivity through a normal level of feeling to extremes of a circular depression or catatonic excitement. L. S. G.

518.3 : 532.542.1 *see Abstr.* 1044

519.26 : 578.087 *see Abstr.* 1211

519.262.2 : 578.087 1005

Statistical treatment of percentage counts. WADLEY, F. M. *Science*, 98, *pp.* 536–538, *Dec.* 17, 1943.

519.28 : 591.18 1006

A statistical consequence of the logical calculus of nervous nets. LANDAHL, H. D., MCCULLOCH, W. S., AND PITTS, W. *Bull. Math. Biophys.*, 5, *pp.* 135–137, *Dec.*, 1943.—A formal method is derived for converting logical relations among the actions of neurons in a net into statistical relations among the frequencies of their impulses. L. S. G.

519.47 1007

On a generalization of Reidemeister's figure in a web. CHOUDHURY, A. C. *Bull. Calcutta Math. Soc.*, 35, *pp.* 77–80, *June*, 1943.—The relations produced by Reidemeister's figure in a quasi-group are considered and these are generalized by considering the figure in which the edges are 2 hexagons. It is found that, because this figure is closed, the relation $ad = bc$ admits a commutative transformation, although the products ad and bc may not be commutative. L. S. G.

523.2 1008

Origin of the solar system. HUNTER, A. *Nature, Lond.*, 153, *pp.* 255–256, *Feb.* 26, 1944.

523.77 1009

On the presence of phosphorus in the solar atmosphere. RAO, K. N. *Indian J. Phys.*, 17, *pp.* 197–203, *Aug.*, 1943.—Continuing previous work [Abstr. 639, 2116 (1943)], the presence of the P_2 molecule in the solar atmosphere is discussed, by a study of the coincidences of the lines of 2 of its strong bands, (8, 27) and (9, 28), in the near ultra-violet, with the Fraunhofer lines. It is concluded that the P_2 mol. exists in the Sun.

523.877 1010

Hydrogen content of the sun and of stars of small masses. SEN, N. R., AND BURMAN, U. *Nature, Lond.*, 153, *pp.* 166–167, *Feb.* 5, 1944.

523.899 1011

Stellar parallaxes determined photographically at the Cape Observatory (Fourteenth list). *Mon. Nat. Roy. Astr. Soc.*, 103, 6, *pp.* 348–353, 1944. A. HU.

53 1012

Sessions of the physico-mathematical department of the Academy of Sciences of the USSR. *J. Phys., USSR*, 6, 5, *pp.* 224–232, 1942.—Summaries of the following papers, with discussions: Visual observations of quantum fluctuations of the light field, Vavilov, S. I. [Abstr. 1102 (1944)]; Low-pressure mercury lamps and their bactericidal action, Tumerman, L. A. [Abstr. 779 (1944)]; On the thermal conductivity of the dielectrics at temperatures lower than the Debye temperatures, Pomeranchuk, I. J. [Abstr. 1109 (1944)]; On the intermediate state of superconductors, Landau, L. D. [Abstr. 1122 (1944)]; Investigation of the intermediate state of a superconducting sphere, Shalnikov, A. I. [Abstr. 1123 (1944)]; On the rigidity of liquids, Kornfeld, M. O. [Abstr. 1037 (1944)]; Equations of turbulent flow of an incompressible viscous liquid, Kolmogorov, A. N. [Abstr. 1042 (1944)]; On atmospheric turbulence, Obukhov, A. M. [Abstr. 1209 (1944)]; On shock waves, Landau, L. D. [Abstr. 1057 (1944)]; Emission of sound by a moving source, Blochintzev, D. I. [Abstr. 1056 (1944)]; Voltage fluctuations in electronic semi-conductors, Davidov, B. I. [Abstr. 1119 (1944)]; Soft and hard components of cosmic rays and the spin of the meson, Alichanjan, A. I., Alichanov, A. I., and Nikitin, S. [Abstr. 1132 (1944)].

53.081 1013

Terminology and symbols in physics. DUNCANSON, W. E. *Phil. Mag.*, 35, *pp.* 81–90, *Feb.*, 1944.—A discussion of quantities where difficulties or errors are likely to arise from loose or wrong terminology; an attempt to formulate rigorous definitions and precise symbols. Considerations cover density, sp. vol., sp. heat [Abstr. 44 (1943)], permittivity and permeability [Abstr. 41 (1943)], Avogadro's number, gram molecule, mol. weight, velocity [Abstr. 1014 (1944)], and the choice and availability of suitable symbols. N. M. B.

53.081 : 539.155 1014

Molecular weight, gram molecule, and Avogadro's number. DUNCANSON, W. E. *Phil. Mag.*, 35, *pp.* 73–80, *Feb.*, 1944.—An examination and discussion of the precise definitions of these quantities in order to remove confusion due to looseness of terminology involving mol. wt. (ratio) and gm. mol. (mass), or gm. mol. (= a number of molecules, or their mass). "Avogadron" is suggested for the number of molecules denoted by Avogadro's number (i.e. an Avogadron of molecules). The new rigid formulation is applied to the temperature and volume equations, the gas const., mol. ht., and lat. ht. N. M. B.

530.1 : 165 *see Abstr.* 987

530.12 : 531.18 1015

Introductory notes on a reformulation of the special theory of relativity. SCOTT-IVERSEN, P. A. *Phil. Mag.*, 35, *pp.*105–120, *Feb.*, 1944.—A reformulation of the mechanics of the classical theory of special relativity in which, between any two inertial frames of reference, the units of length, time and mass are invariants, and simultaneity is absolute. The requirements of the Lorentz transformation are met by an appropriate choice of simultaneity for events at different places.

530.145 1016

Statistical mechanics of fields and the "Apeiron." BORN, M., AND PENG, H. W. *Nature, Lond.*, 153, *pp.* 164–165, *Feb.* 5, 1944.—The field in a finite volume Ω as a mechanical system described by its total energy and momentum is considered. The latter are obtained from the classical expressions for the energy-momentum densities simply by multiplication with Ω. Each field component is considered as an operator.

530.145.6 1017

Quantum mechanics of fields. I. Pure fields. BORN, M., AND PENG, H. W. *Proc. Roy. Soc. Edinb. A*, 62, 1, *pp.* 40–57, 1944.—Comparison of the difficulties occurring in the usual treatment of quantized field theories with those of Bohr's semi-classical quantum mechanics of particles suggests similar remedy. The Fourier series for the field components have no exact significance. Single terms only are considered, and are replaced by matrix elements. The

treatment is applied to scalar, vector, and spinor fields. A. J. M.

530.145.6 : 512.97 1018

The impulse-energy tensor of material particles. I. Mesons and electrons. CHANG, T. S. *Proc. Roy. Soc. A*, 182, *pp.* 302–318, *March* 1, 1944.—A direct and general construction is given, from the field quantities of the electrons and mesons and their derivatives, of a real, symmetrical and gauge-invariant tensor T_{kl} whose divergence to l is -1 times the 4-force f_k experienced by the latter. Interpreting T_{kl} as the impulse-energy tensor of the material particles, for the case of no electromagnetic field, the energy-momentum density obtained from T_{k4} is compared with that obtained from treating $(\hbar/i)\,(\partial/\partial x_k)$ as the energy-momentum operator. Further, in the general case the Hamiltonian of the matter is compared with $\int T_{44}dxdydz$.

530.145.6 : 537.2 1019

Polarization of the vacuum in the meson theory. GUPTA, S. *Proc. Nat. Inst. Sci. India*, 9, 2, *pp.* 337–350, 1943.—Expressions for the charges induced in the vacuum of the vector and scalar meson theories by an electric field, assumed to be much smaller than a crit. field, have been obtained. Deviations from Coulomb's law for the mutual potential energy of point charges are due to polarization of the vacuum. The effect of these deviations on the scattering of heavy particles is discussed. A. J. M.

530.145.6 : 537.591.2 : 537.2 : 538.69 1020

Electromagnetic field and the self-energy of the meson. GUPTA, S. *Proc. Nat. Inst. Sci. India*, 9, 1, *pp.* 173–192, 1943.—Using Kemmer's equation for the meson, the charge distribution, electromagnetic field and self-energy of mesons with spins 1 and 0, are discussed. The charge distribution has a high order of singularity. The self-energy consists of 4 parts, due to the static field, the magnetic field, the transverse electric field, and the forced vibrations under the zero-point fluctuations of the radiation field. The second and third of these are zero for the spinless meson. The results are compared with those for an electron on the positron theory. A. J. M.

530.145.6 : 537.591.8 1021

On the elastic scattering of the fast mesons. GUPTA, S. *Proc. Nat. Inst. Sci. India*, 8, 3, *pp.* 369–375, 1942.—The differential cross-sections of the elastic scattering of mesons with spin 1 and 0 are calculated on the basis of Kemmer's equation for the meson. A. J. M.

530.145.6 : 537.591.8 : 537.12 1022

On the collision between meson and electron. GUPTA, S., AND MAJUMDAR, R. C. *Proc. Nat. Inst. Sci. India*, 8, 2, *pp.* 199–216, 1942.—The cross-sections for meson-electron collision for different values of meson spin are investigated on the basis of quantum electrodynamics. A. J. M.

530.145.63 : 537.122 *see Abstr.* 1113

531.18 : 530.12 *see Abstr.* 1015

531.19 1023

The new statistical mechanics. DARROW, K. K. *Bell Syst. Techn. J.*, 22, *pp.* 362–392, *Oct.*, 1943.—The fundamental principles are reviewed, with sp. ref. to monatomic gases. [See Abstr. 1868 (1943)].

531.19 : 533.7 1024

Spontaneous energy fluctuation and quantum statistics. BISWAS, B. N. *Bull. Calcutta Math. Soc.*, 35, *pp.* 55–59, *June*, 1943.—Expressions are derived for: (*a*) the energy fluctuation at const. volume of a perfect monatomic gas under conditions of negligible degeneracy; (*b*) the fluctuation of the number per "S" type of cell in the cases of Maxwell–Boltzmann, Bose–Einstein and Fermi–Dirac distributions; (*c*) the energy fluctuation of quanta; (*d*) the energy fluctuation of a monatomic solid. L. S. G.

531.19 : 548.0 : 536.7 1025

Matrix theory of correlations in a lattice. I–II. EISENSCHITZ, R. *Proc. Roy. Soc. A*, 182, *pp.* 244–269, *March* 1, 1944.—The statistical mechanics of some crystalline systems may be reduced to statistical correlations between unit cells of a fictitious lattice, deduced from postulates according to which some configurations of the cells are incompatible with some configurations of neighbouring cells; if configurations of neighbours are compatible with each other, their probabilities are to combine by multiplication. By these postulates, matrices are implicitly defined such that the probability distribution for a chain of cells is found by forming the powers of a matrix. A similar approach to the statistics of a lattice involves infinite matrices. The specific-heat curve corresp. to order-disorder equilibrium is derived from the nearest-neighbour model. For a lattice in 2 dimensions the resulting thermodynamic energy is an algebraic expression; for a lattice in 3 dimensions the thermodynamic energy is found by numerical methods. The c_v curve has a broad max. and has no resemblance to the experimental c_p curve.

531.224.4 1026

Eccentrically loaded concrete columns. PRIDDLE, R. A. *J. Instn Engrs Aust.*, 15, *pp.* 247–251, *Nov.–Dec.*, 1943.—Three original graphs are presented which facilitate the design of reinforced-concrete rectangular columns carrying direct loads plus bending. Reference is made to a beam method for the design of such columns.

531.234 1027

The moment-distribution method. TODD, J. A. *J. Instn Civ. Engrs*, 21, *pp.* 45–48, *March*, 1944.—The author shows that the method of successive approximation, due to Cross, when applied to the problem of determining the b.m. along a horizontal beam subjected to vertical loads yields a convergent solution in which actual limits for the error at each stage of the process may be assigned. G. E. A.

531.25 : 629.135.038 = 3 1028

Calculation of the stiffness of a rotating propeller blade. MATTHIEU, P. *Schweiz. Arch. angew. Wiss. Techn.*, 9, *pp.* 325–336, *Nov.*, 1943.—An investigation made in connection with the Escher Wyss propeller in which the blades are adjustable to act in the normal manner or as brakes. A theory is developed in which only those factors are considered which are of practical importance, and approximations are employed by means of which the calculation of the stiffness of a rotating propeller blade is brought into a form comparatively easy to deal with. The form of the problem so obtained enables the theory to be built up in a simple manner. G. E. A.

531.258 1029

Stress systems in rotating aeolotropic discs. GHOSH, S. *Bull. Calcutta Math. Soc.*, 35, *pp.* 61–65, *June*, 1943.—Continuing a previous paper [Abstr. 2696 (1943)], a study is made of the stress distribution when the disc has a circular or elliptic boundary. L. S. G.

531.39 1030

Periodic orbits for four finite bodies with repulsive and attractive forces. BUCHANAN, D. *Trans. Roy. Soc. Can.*, 37, *pp.* 1–7, *May*, 1943.—Restricted motion is considered in which one pair of bodies is constrained to move in a plane and the other pair move to and fro on opposite sides of the plane and along a normal. The law of force is the inverse square. There are 3 classes of orbits differing according to their periods, which vary with the ratio of the magnitudes of the attractive and repulsive forces. L. S. G.

531.717 = 3 1031

Instrument for measuring the wall thickness of long tubes. *Dtsch. Sportflieger*, 10, *p.* 164, *Oct.*, 1943.—A new type of caliper gauge, designed by the Junkers firm, employing a U-shaped feeler, is described.

A. E. T.

531.733 : 591.12 1032

A small recording spirometer. NICKERSON, J. L., KING, B. G., AND CURTIS, H. J. *Rev. Sci. Instrum.*, 15, *pp.* 12–13, *Jan.*, 1944.

531.76 1033

Instruments for measuring speeds and accelerations. THOMAS, I. H., AND VINCENT, J. J. *J. Sci. Instrum.*, 21, *pp.* 45–48, *March*, 1944.—The accelerometer is a null instrument in which the force exerted by a weight freely supported in the moving body is balanced by a calibrated compression spring. The final result is given in units of g. The principle of the speedometer, of which the theory is given, is based on the fact that a helical spring, moving longitudinally with a mass attached to its leading end, will extend if the other end is suddenly stopped. The extension of the spring is $\propto$ the speed of the moving body immediately before it is brought to rest and is not appreciably affected by variations in some of the characteristics of the moving body. The instrument gives the speed directly in ft./sec.

531.763 : 621.383 1034

Photo-electrically operated stop-watch. WEY, R. J. *Electronic Engng*, 16, *pp.* 334–336, *Jan.*, 1944.—[Abstr. 984 B (1944)].

531.787(091) 1035

The history of pressure-responsive elements. HUNT, L. B. *J. Sci. Instrum.*, 21, *pp.* 37–42, *March*, 1944.

531.787.089.6 = 3 1036

Accuracy of manometers. GERBER, H. *Bull. Ass. Suisse Élect.*, 35, *pp.* 47–48, *Jan.* 26, 1944.—Points out slight difference between the readings of 3 different manometers and the calculated static head of water pressures up to heads of 2 000 m. The compressibility of water is not sufficient to explain the differences. E. O. T.

532.12 1037

On the rigidity of liquids. KORNFELD, M. O. *J. Phys., USSR*, 6, 5, *p.* 227, 1942.

532.122 : 534.321.9 1038

Adiabatic compressibilities of some aqueous ionic solutions and their variation with indicated liquid structure of the water. COREY, V. B. *Phys. Rev.*, 64, *pp.* 350–357, *Dec.* 1 *and* 15, 1943.—The adiabatic compressibilities of aq. solutions of 27 strong electrolytes, each at a single conc., were determined at 25°C. from sound-velocity measurements at 1 015·24 kc./s. The change in compressibility per mole fraction of solute shows satisfactory correlation with X-ray and other indications of water structure change. Adiabatic compressibility values show correlation with corresp. values of the partial molal vol. of the solvent water. Evidence supports the conclusion that water has a liquid structure which becomes more highly co-ordinated and compacted with the introduction of ions.

532.13 : 666.1/.2 1039

The viscosity and working characteristics of glasses. III. Some observations on the rate of cooling and viscosity of glasses during manipulation by hand. BOOW, J., AND TURNER, W. E. S. *J. Soc. Glass Technol.*, 27, *pp.* 207–237(*T*), *Oct.*, 1943.—The factors which determine the most favourable conditions for the shaping of molten glass are temperature and viscosity; and these are related to the composition of the glass, its colour (diathermancy), weight of glass gathered and shape of article produced. Numerous tables and curves show the interrelation of these factors and of the compositions and gathering temperatures of the glasses with the times occupied by the successive stages of manipulation.

532.133 : 532.14 : 541.68 1040

Viscosities at the boiling point of some primary amines, cyclohexane, and some of its derivatives. FRIEND, J. N., AND HARGREAVES, W. D. *Phil. Mag.*, 35, *pp.* 57–64, *Jan.*, 1944.—The rheochor [Abstr. 2708 (1943)] is evaluated from experimental data tabulated for 10 primary amines, and for C_6H_{12} and 5 of its derivatives. Viscosity/temp. curves are plotted. The effect on the C_6H_6 ring of successive NH_2 substitutions is shown. The replacement of H in C_6H_{12} by Cl, NH_2, Br and OH progressively increases the viscosity, but CH_3 reduces it. N. M. B.

532.133 : 541.182.6.025 1041

Effect of sand on the viscosity, yield value and thixotropic gelation of mud suspensions. MUKHERJEE, J. N., AND MAJUMDAR, B. R. *Proc. Indian Ass. Cult. Sci.*, 26, *pp.* 3–6, *Aug.*, 1943.—The work was undertaken to investigate the probable causes of stuck drill pipes in oil-wells. The effect of the sand concentration in modifying the viscous properties and thixotropy of drilling mud was studied.

532.14 : 541.68 : 532.133 *see Abstr.* 1040

532.516 : 536.658 *see Abstr.* 1111

532.517.2 : 535.55 = 3 *see Abstr.* 1096

532.517.4 1042

Equations of turbulent flow of an incompressible viscous liquid. KOLMOGOROV, A. N. *J. Phys., USSR*, 6, 5, *pp.* 227–228, 1942.

532.517.4 1043

On a statistical model of isotropic turbulence. SYNGE, J. L., AND LIN, C. C. *Trans. Roy. Soc. Can.*, 37, *pp.* 45–79, *May*, 1943.—A statistical theory of homogeneous isotropic turbulence is developed by regarding the turbulent fluctuations as due to Hill's vortices moving about chaotically. The calculated velocity correlation tensor of the second order satisfies the general relations of von Kármán, and the shape

of the correlation function is in general agreement with experimental results.

532.542.1 : 518.3 1044

Practical alignment chart for fluid flow in pipe-lines. MEYER, P. *J. Inst. Petrol.*, 30, *pp.* 52–56, *Feb.*, 1944.—A monograph for determining the various quantities entering the equations for fluid flow in commercial pipe lines, viz., $Q = 34{\cdot}5\ (D^5P/GLF)^{\frac{1}{2}}$ for liquids, F denoting the friction factor, and $Q = \text{const.}\ [D^5(P_1^2 - P_2^2)/GTLF]^{\frac{1}{2}}$ for gases, is given and discussed by means of numerical examples.

J. S. G. T.

532.583 : 629.12.015 1045

Steering experiments. GAWN, R. W. L. *Trans. Instn Nav. Archit., Lond.*, 85, *pp.* 35–72, 1943.—Early steering tests, including measurement of the force and the centre of pressure in the case of planes, are briefly described. Recent experimental work carried out at the Admiralty Experiment Works, Haslar, using controlled warship models to ascertain rudder torque and force, and turning moment, and with free models to obtain turning paths, are referred to. Effects of hull reaction and propeller race are studied, together with results due to modifications of hull and rudder. Comparison is made with the results of tests on aircraft models. Approx. methods are suggested for estimating normal rudder force and torque.

J. S. G. T.

532.612 : 591.339 1046

Physical properties of the allantoic and amniotic fluids of the chick. III. Surface tension. WALKER, P. A. *J. Gen. Physiol.*, 27, *pp.* 29–36, *Sept.*, 1943.—The study of the changes occurring during incubation in the surface tension of the 2 extra-embryonic fluids of the hen's egg has yielded results which in part harmonize with previous studies of the chemical and physical nature of these liquids, and which in part are quite inexplicable in the light of these investigations. The apparatus used was the du Noüy tensiometer.

C. J. G.

532.613 : 537.36 : 541.183.7 1047

The determination of ionic adsorption in the Helmholtz–Gouy (electrical) layers by the combination of electrokinetic and interfacial-tension measurements. DICKINSON, W. *Trans. Faraday Soc.*, 40, *pp.* 48–59, *Feb.*, 1944.—[See Abstr. 2551 (1940)]. The attempt is made to correlate semi-quantitatively the electrokinetic behaviour of the cetyl-acetate/water interface as influenced by KCl, KI and KCNS with the effects produced by these salts upon the interfacial tension. The treatment is based on a combination of fixed and diffuse electrical double layers with the Gibbs adsorption isotherm. Anion and cation adsorptions for each salt are calculated for fixed and mobile portions of the total double-layer region. Iodide and thiocyanate ions exhibit pos. adsorption over the whole range of conc. The chloride ion in the most dilute range shows a slight pos. adsorption which later becomes neg. The K ion from KI and KCl shows neg. adsorption over the range of conc. For KCNS, the K ion surface excess is approx. 0 over the whole conc. range.

532.613.4 1048

Interfacial tension of sodium secondary alkyl sulphate solutions against oils. AICKIN, R. G. *J. Soc. Dy. Col., Bradford*, 60, *pp.* 36–40, *Feb.*, 1944.—Measurements at 20° against a hydrocarbon fraction and other oils show a sharp break in the interfacial-tension (γ)/conc. curve at the critical conc. which is independent of the oil phase. There is good agreement of the vals. for the critical conc. by this method and by a flotation method. The addition of electrolytes to the alkyl solution reduces the γ of the system and the critical conc. This effect is due almost entirely to ions of sign opposite to that of the long-chain ions. Divalent ions have more effect than univalent ions, and the latter fall into a lyotropic series. The ions (those least hydrated) which approach closer to the interfacial film have the greater influence on the γ of the system. The nature of the surface-active species is critically discussed; results can be explained on the basis that the single long-chain ion is the surface-active entity.

N. M. B.

532.62 : 536.791.2 : 546.291 1049

Surface flow of liquid helium II and Bose–Einstein degeneracy. GOGATE, D. V., AND RAI, R. N. *Nature, Lond.*, 153, *p.* 342, *March* 18, 1944.—[See Abstr. 108 (1939)].

532.62 : 632.94 : 539.217 *see Abstr.* 1165

532.73 1050

The salting-out effect. MORRISON, T. J. *Trans. Faraday Soc.*, 40, *pp.* 43–48, *Feb.*, 1943.—The salting-out effects of uni-univalent electrolytes on phenol, phenylacetic acid and benzoic acid were examined at different conc. and temp. The equation $\log s_0/s = k_1c^\beta$ fits the data more satisfactorily than the Setschenow equation $\log s_0/s = kc$, when conc. are expressed in mols. per 1 000 g. of solvent. Both k_1 and β vary with temperature. The Debye–McAulay theory of salting-out explains qualitatively the increase in k_1 (or k) with rise in temperature, but fails to predict the large and specific effects of different salts and solutes. There is a close relation betw. variation in solubility (in the pure solvent) with temperature and variation in salting-out effect (measured by k_1 and β).

532.782 : 666.942 : 548.24 *see Abstr.* 1202

533.15 : 539.155.2 : 535.336.2 *see Abstr.* 1075

533.56 1051

Modified diffusion pump for analysis of gases in metals. NAUGHTON, J. J., AND UHLIG, H. H. *Industr. Engng Chem. (Analyt. Edit.)*, 15, *pp.* 750–751, *Dec.* 15, 1943.

533.7 : 531.19 *see Abstr.* 1024

533.7 : 537.58 1052

Attainment of thermal equilibrium between a gas and a hot surface. DOTY, P. M. *J. Chem. Phys.*, 11, *pp.* 557–559, *Dec.*, 1943.—From an analysis of some results obtained by Bryce [Abstr. 288 (1937)] it is concluded that within the small experimental error, all the hydrogen molecules hitting a hot tungsten filament attain thermal equilibrium with the hot surface. This conclusion is not regarded as having general application, but probably holds for molecules and surfaces between which chemi-adsorption occurs.

R. W. P.

[534.11 + 621.92 + 621-752 + 621.85] : 539.62 *see Abstr.* 1185

534.121.3 1053

Some experiments on an elephant bell. BRAILSFORD, H. D. *J. Acoust. Soc. Amer.*, 15, *pp.* 180–187, *Jan.*,

944.—The bell, made of brass, is roughly ellipsoidal n shape. The upper half is a hollow shell, and the ower half consists of 15 inwardly curving prongs. There is a handle at the top and a sound bow round he middle, of dia. 6·5 cm. The bell was fixed and struck by a motor hammer, and the resulting sound nalysed. The spectrum gives a large number of components with frequencies from 34 to 8 600, the prongs being the source of many of the low frequencies. A vibration analysis of the sound bow was obtained by means of a pick-up. The cavity of the bell resounded to a frequency 3 000 which was the difference of components 4 300 and 1 300. The strike note had frequency 370 but was not present in the vibration spectrum. The apparent object of the design is to achieve a low and mellow tone quality in a small-sized unit. G. E. A.

534.133 : 621.396.621.57 : 548.0 1054

Quartz crystals. DRUESNE, M. A. A. *Communications*, 23, *pp.* 46, 48, 50, 109 *and* 111, *Sept.*, 1943.—Discusses the modes of vibration of quartz crystals, including the underlying mathematical formulae, and outlines the methods used in the manufacture of such crystals for use in communication equipment. J. T.

534.152 1055

Vibration displacement indicator. DIMOND, H. M. *Gen. Elect. Rev.*, 46, *pp.* 687–688, *Dec.*, 1943.—An instrument for locating and correcting excessive and unwanted vibrations. It is hand-held with a pointed stylus in contact with the vibrating body. A mirror attached to the stylus causes a spot of light to vibrate along a glass scale and to appear as a band of light the length of which indicates the magnitude of the vibration. The vibration velocity and acceleration may be calculated or found from the logarithmic charts supplied. G. E. A.

534.21 1056

Emission of sound by a moving source. BLOCHINTZEV, D. I. *J. Phys., USSR*, 6, 5, *p.* 230, 1942.

534.222.2 1057

On shock waves. LANDAU, L. D. *J. Phys., USSR*, 6, 5, *pp.* 229–230, 1942.

534.321.3 : 786.6 1058

A keyboard instrument in just intonation. WILLIAMSON, C. *J. Acoust. Soc. Amer.*, 15, *pp.* 173–175, *Jan.*, 1944.—The design previously proposed [Abstr. 4652 (1939)] has been set up and tested. It contains 5 octaves of open diapason pipes of which one set is equally tempered. More than 9/10 of the musical compositions in existence are diatonic in character. The instrument can be played in just intonation in any major or minor key, and can be instantly converted to tempered intonation when desired. G. E. A.

534.321.9 : 532.122 *see Abstr.* 1038

534.413 1059

Simple sensitive flames. SUTHERLAND, G. A. *Nature, Lond.*, 153, *pp.* 376–377, *March* 25, 1944.

534.647 : 621.383 : 621.317.087 1060

An electronic seismographic recorder. KELLER, F. *Seism. Obs. Bull. Univ. Pittsburgh*, 1, 2, *pp.* 24–28, *Dec.*, 1942.—[Abstr. 920 B (1944)].

534.75 : 534.833 *see Abstr.* 1062

534.773.1 1061

Experiments on Pohlman's mechanical hearing aids. LOWY, K., AND GROSS, N. *J. Acoust. Soc. Amer.*, 15, *pp.* 160–163, *Jan.*, 1944.—The device tested consists of a thin circular membrane mounted within a cylindrical gelatine tube. A nylon rod is firmly fitted into the centre of the membrane, and its inner end can be put in contact with the footplate of the stapes, thus forming an artificial eardrum and chain of bones. Experiments on cats indicate that the device is an effective hearing aid if applied to the region of the stapes. [See Abstr. 2297 (1942)]. G. E. A.

534.833 : 534.75 1062

Ear defenders. WATSON, N. A., AND KNUDSEN, V. O. *J. Acoust. Soc. Amer.*, 15, *pp.* 153–159, *Jan.*, 1944.—The defenders are made of a special compound of neoprene which is superior to rubber in several ways. They are designed to provide the greatest insulation consistent with easy insertion and comfort in use. G. E. A.

534.834 1063

The study of sound attenuation in air ducts. CHURCHER, B. G., AND KING, A. J. *Metrop.-Vick. Gaz.*, 20, *pp.* 260–264, *Jan.*, 1944.—[See Abstr. 134 (1944)].

535.14 1064

Non-linear quantum electrodynamics of the vacuum. MCCONNELL, J. *Proc. Roy. Irish Acad. A*, 49, *pp.* 149–176, *Dec.*, 1943.—The first step in an attempt at a quantum-mechanical description of the electromagnetic field based on Born's non-linear electrodynamics, rather than on Maxwell's theory. Results of the work do not affect the refraction of light by light discovered by Schrödinger [Abstr. 94 (1943)], and confirm that two light rays experience mutual scattering. A. J. M.

535.14 : 537.534.8 1065

Production of mesons by light quanta and related processes. HAMILTON, J., AND PENG, H. W. *Proc. Roy. Irish Acad. A*, 49, *pp.* 197–224, *Jan.*, 1944.—The transformation of a light quantum into a meson during collision with a proton is considered, difficulties formerly encountered in this problem due to damping being overcome. The cross-sections for the process and its reverse are small enough to agree qualitatively with experiment. The "principle of detailed balance" is also discussed. This principle no longer holds in its most general form in the theory of damping developed. A. J. M.

535.215.6 : 621.314.634 = 3 1066

On the spectral sensitivity distribution of selenium barrier-layer cells. ECKART, F., AND SCHMIDT, A. *Z. Phys.*, 118, 3–4, *pp.* 199–209, 1941.—The influence of Cd additions on the photo-electric properties of Se barrier-layer cells is studied. The second max. which occurs, at 0·7 μm., is attributable, not to Cd centres of disturbance, but to the heterogeneous photo-electric modification of the CdSe regions in the Se layer. H. G. S.

535.222 1067

A measurement of the velocity of light in water. HOUSTOUN, R. A. *Proc. Roy. Soc. Edinb. A*, 62, 1, *pp.* 58–63, 1944.—In a previous communication [Abstr. 2643 (1941)] the author described a method which replaced Fizeau's toothed wheel by a piezo-

quartz. This acts as an intermittent diffraction grating and interrupts the beam 200 times more rapidly than Fizeau's wheel. The paper describes the application to the measurement of the velocity of light in water. The total length of path in water was 8 m. and the velocity was measured for red, green and blue light with an accuracy of 1 : 700. The results agree with the formula for group velocity.

535.243 1068

Spectrophotometric formulation. PARK, R. H., AND STEARNS, E. I. *J. Opt. Soc. Amer.*, 34, *pp.* 112–113, *Feb.*, 1944.—Methods are presented whereby the formulation of colorants needed to effect a visual colour match of a given std. may be computed from spectrophotometric measurements of the colorants and std.

535.247.4 : 535.361.2 1069

A photo-electric photometer for measuring the light scattered by the surface of a transparent material. SOWERBY, J. McG. *J. Sci. Instrum.*, 21, *pp.* 42–45, *March*, 1944.—The photometer described measures the light scattered at 45° from the surface of a transparent plastic which has suffered abrasion. The abraded portion of the plastic is illuminated by a l.v. lamp *via* a lens system, and the scattered light falls on a sensitive vacuum photocell coupled to an amplifier. The amplifier drives a "tuning-eye" whose shadow is always returned to a given mark, and the adjustable element is a scaled potentiometer.

535.31 1070

An approximate expression of Fresnel's formulae for large angles of incidence. HERSHUN, A. A. *C.R. (Doklady) Acad. Sci. URSS*, 32, 6, *p.* 400, 1941.—An approximation is derived for Fresnel's formulae for amplitudes at reflection, which leads to the result that for grazing incidence of light, the log. of the coefficient of reflection is $\propto$ the angle betw. the ray and the surface. A. E. T.

535.31 : 548.0 : 539.181 = 3 *see Abstr.* 1160

535.316/.317 1071

Replacing a thin lens by a thick lens. HERZBERGER, M. *J. Opt. Soc. Amer.*, 34, *pp.* 114–115, *Feb.*, 1944.

535.317.6 : 512.26 1072

Tracing skew rays through second-degree surfaces. BAKER, T. Y. *Proc. Phys. Soc., Lond.*, 56, *pp.* 114–122, *March*, 1944.—Apart from the mathematical treatment for the tracing of skew rays through second-degree surfaces, details are given of a special set of log. tables devised to help in the solution of quadratic equations. A. H.

535.317.6 : 744 1073

Drawing instrument for tracing rays through optical systems. *J. Sci. Instrum.*, 21, *pp.* 50–51, *March*, 1944.—The device consists of a 60° set-square (transparent) on which is arranged a special scale calibrated in terms of ref. index, from 1·0 to 2·0. On a line parallel to the hypotenuse edge, small holes are spaced at a distance = unity corresp. to some suitable scale. Farther along are 2 adjustable slides with other holes, with index lines reading off the main scale.

535.33.03 : 545.828 : 546.76 : 546.74 : 669.144.3 1074

Spectrographic determination of nickel and chromium in stainless steel. COULLIETTE, J. H. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 732–734, *Dec.* 15, 1943.—Ni and Cr in stainless steel can be determined by the spectrographic method using the interrupted spark as a source of radiation. Details of procedure for preparing working curves and making determinations are given. The method is recommended for control of routine melting operations; its precision compares satisfactorily with ordinary analytical determinations. M.-V.

535.336.2 : 533.15 : 539.155.2 1075

A mass spectrometer and gaseous thermal diffusion isotope separator. TAYLOR, J. E. *Rev. Sci. Instrum.*, 15, *pp.* 1–8, *Jan.*, 1944.—A Nier-type mass spectrometer is described in which the const. deflecting magnetic field is provided by a permanent magnet. An auxiliary magnetic field parallel to the electron beam in the ion source was necessary. A 6-tube gas thermal-diffusion apparatus with convective coupling for concentrating heavy C is described. This unit yields concentrations of C^{13} up to 20%. The conc. was observed as a function of time and the equilibrium conc. compared with theory.

535.338.3 : 546.49 = 3 1076

Intrinsic-pressure broadening of mercury lines. ROMPE, R., AND SCHULZ, P. *Z. Phys.*, 118, 3–4, *pp.* 269–276, 1941.—The experimental results of earlier investigations in the pressure range $p = 4 \cdot 5$ to 80 atm. are compared with theoretically derived formulae. The intrinsic-pressure broadening depends on the number of the atoms of the same type and the *f*-number of the transition from the broadened term to the ground state. The measuring method is explained. The arc temperatures range between 7 300°–8 400°K. The atomic densities are $4 \cdot 56 \times 10^{18}$ to $7 \cdot 25 \times 10^{19}$ atoms/cm.^{2}. The measured half-value widths lie between $9 \cdot 2$–$3 \cdot 2$ cm.$^{-1}$. H. G. S.

535.338.3 : 546.49.02 1077

The structure of λ5 461 of mercury (198). WIENS, J. H. *Phys. Rev.*, 65, *p.* 58, *Jan.* 1 *and* 15, 1944.

535.338.4 1078

A laboratory experiment on the band spectrum of fluorine. BROWN, S. C., AND ELLIOTT, L. G. *Amer. J. Phys.*, 11, *pp.* 311–316, *Dec.*, 1943.—Describes the set-up, etc., for a laboratory experiment to determine the angular momentum of the fluorine nucleus by measurements on the alternating intensities exhibited in the F_2 spectrum. A. H.

535.338.4 : 546.17 1079

The band spectrum of nitrogen: new singlet systems. GAYDON, A. G. *Proc. Roy. Soc. A*, 182, *pp.* 286–301, *March* 1, 1944.—Five new systems due to N_2 were observed in condensed discharge. Rotational analyses of some bands were made; all correspond to transitions to the $a^1\prod_u$ upper level of the Lyman–Birge–Hopfield System. An additional progression of the system studied by van der Ziel (Fifth Positive System) was found, necessitating a revision of the upper vibrational quantum numbers. Some of Kaplan's systems were examined, one corresponds to a transition to the lower level of the Fifth Positive System.

535.338.4 : 546.172.6 1080

The band spectrum of NO: the gamma and epsilon systems. GAYDON, A. G. *Proc. Phys. Soc., Lond.*, 56, *pp.* 95–103, *March*, 1944.—The spectrum of NO

was studied in a transformer discharge and in a silent ozonizer-type discharge. Bands of the γ, ε and δ systems were photographed and measured. From the measurements and intensity distribution it is shown that the γ and ε systems are separate [see Abstr. 1843 (1940)]. There is no evidence for predissociation in the γ or ε systems. It is difficult to reconcile the observations with a value for the heat of dissociation of NO as low as 5·29 eV.

535.338.4 : 546.817 : 546.23 1081

An emission band-system of PbSe. BARROW, R. F., AND VAGO, E. E. *Proc. Phys. Soc., Lond.*, 56, *pp.* 76–78, *March*, 1944.—A band-system ($D \rightarrow X$) assigned to PbSe was excited by a heavy-current, uncondensed, positive-column discharge through the vapour of PbSe contained in a silica tube. About 40 bands in the region 3 350–3 850 Å were photographed in the first order of a grating instrument with dispersion 7·4 Å/mm. The vibrational analysis leads to the following expression for the wave numbers of the band-heads: $\nu_{head} = 28\,416{\cdot}9 + (190{\cdot}5u' - 0{\cdot}6u'^2) - (277{\cdot}4u'' - 0{\cdot}56u''^2)$, where $u = v + 1/2$. The identity of the value of ω_e'' with that for the ground state of PbSe [Abstr. 714 (1938)] shows that the lower state of the new transition is the ground state.

535.338.4 = 3 1082

Predissociation phenomena in the CH and CD bands. GERÖ, L., AND SCHMID, R. *Z. Phys.*, 118, 3–4, *pp.* 210–216, 1941.—The spectra of the CH and CD bands which were obtained by varying the conditions of excitation and pressure in the source of light show several predissociation phenomena. Boundary curves are given and the positions of atomic-term combinations are determined. The most probable co-ordination of the C + H end of the C + D terms in relation to the CH and CD molecular terms is indicated. The heavier isotope (the CD molecule) has a rather higher stability than the lighter one. H. G. S.

535.342-1 1083

Infra-red spectroscopy. Industrial applications. BARNES, R. B., LIDDEL, U., AND WILLIAMS, V. Z. *Industr. Engng Chem. (Analyt. Edit.)*, 15, *pp.* 659–709, *Nov.* 15, 1943.—The theory of infra-red absorption and its relation to mol. structure are discussed to provide background for detailed descriptions of techniques useful in analysis. 363 representative spectrographs of organic compounds taken in the rock salt region of the infra-red spectrum are presented for comparison with those obtained from unknown compounds under investigation.

535.343.4 : 546.811 : 546.24 1084

The absorption spectrum of SnTe. BARROW, R. F., AND VAGO, E. E. *Proc. Phys. Soc., Lond.*, 56, *pp.* 78–85, *March*, 1944.—The absorption of SnTe vapour in the visible region of the spectrum was studied in the range 800°–1 400°C. in evacuated silica tubes. About 140 bands were measured on plates taken in the first order of a 2·4 m. grating (dispersion 7·4 Å/mm.). These have been assigned to 4 systems, one of which ($D \rightleftharpoons X$, $\nu_e \approx 25\,450$ cm.$^{-1}$) has already been observed in emission [Abstr. 1841 (1940)].

535.348 : 551.593.63 1085

Ice-crystal haloes. MELMORE, S. *Nature, Lond.*, 153, *p.* 166, *Feb.* 5, 1944.

535.361.2 : 535.247.4 *see Abstr.* 1069

535.371 1086

The polarization of fluorescence and the law of its decay. TUMERMAN, L. A. *C.R.* (*Doklady*) *Acad. Sci. URSS*, 32, 7, *pp.* 474–477, 1941.—Describes the results of measurements of the polarization at various temperatures of the fluorescence of certain organic dyestuffs in alcoholic solution. These results confirm earlier conclusions concerning the law of decay of fluorescence and the effect of small concentrations of quenchers. [See Abstr. 98 (1942)]. A. E. T.

535.371 1087

On the fluorescence of anthracene in presence of naphthacene. GANGULY, S. C. *Proc. Indian Ass. Cult. Sci.*, 26, *p.* 7, *Aug.*, 1943.

535.372 : 537.311.33 1088

Luminescence of valve metals during electrolytic oxidation. ANDERSON, S. *J. Appl. Phys.*, 14, *pp.* 601–609, *Nov.*, 1943.—When one of certain valve metals (Al, W, T, Zn and Mg) is made the anode in selected electrolytes (oxalic acid) and a current flows, light is emitted. Investigation shows that the spectrum given by this light is characteristic of the metal and its impurities, and is independent of the type of solution, if that solution is one which permits the formation of an oxide film upon the metal. The intensity is not related directly to either current or voltage, but depends on the specimen, its previous treatment and other conditions. The glow is brightest immediately after the metal has been the cathode in the cell. Decay times for such flashes were measured by a phosphoroscope. An explanation of the luminescence is based on the modern theory of conduction in semi-conductors. A. W.

535.375.51 1089

On the Raman spectra of a few alkyl sulphides in the solid state. SIRKAR, S. C., AND BISHUI, B. M. *Proc. Nat. Inst. Sci. India*, 9, 2, *pp.* 287–293, 1943.—The Raman spectra of methyl, ethyl, propyl and butyl sulphide were studied in the liquid and solid states at the temp. of liquid O_2. Disappearance of prominent lines and changes in the rel. intensities of the lines with the solidification of the substance were observed. The changes are correlated in the cases of methyl, ethyl and propyl sulphide to strong association of the molecules in the solid state through H-bond in the first case and a S-bond in the other two cases. In the case of butyl sulphide, the disappearance of the lines is attributed to the absence of free rotation about the C–C bond in the solid state.

535.375.51 : 547.6 1090

Raman spectra of hydrocarbons. IV. 2,5-dimethyl-1,5-hexadiene and 2,5-dimethyl-2,4-hexadiene. CLEVELAND, F. F. *J. Chem. Phys.*, 12, *pp.* 53–55, *Feb.*, 1944.—Raman frequencies, rel. intensities and depolarization factors, are given for (A) 2,5-dimethyl-1,5-hexadiene and (B) 2,5-dimethyl-2,4-hexadiene. (A) contains 2 XYC = CH_2 groups and (B) contains 2 XXC = CHZ groups. In (B) the double bonds are conjugated, in (A) unconjugated. The data for the olefinic lines of (A) are 1 297(50), 1 414(430)0·74, 1 651(1 000)0·21, 2 977(580)0·28 and 3 074(220)0·78. For (B) the olefinic frequencies are 1 227(75)0·46, 1 663(1 000)0·18, 3 012(vw), and 3 040(vw) (vw = very weak). [See Abstr. 2550 (1943)].

535.415 1091

New contributions to interferometry. II. New interference phenomena with Newton's rings. TOLANSKY, S. *Phil. Mag.*, 35, *pp.* 120–136, *Feb.*, 1944.—New interference phenomena are observed with Newton's rings when the lens and glass plate are coated with high-reflecting thin silver films. Very sharp rings are formed in both transmission and reflection, the intensity distribution being analogous to the Fabry–Perot interferometer fringes. Surface errors $<0{\cdot}01\lambda$ can be detected on lenses. At incidences other than normal, the fringes, which are no longer localized in the interference film, become double. The doubling is due to differential phase change at reflection of the light polarized in and perpendicular to the plane of incidence. The components of the doublet are plane polarized at rt. angles to each other. With increasing incidence the parallel magnetic vector component becomes weaker. This is due to a preferential absorption effect. A single thin silver film at non-normal incidence transmits partially polarized light. An analogous doubling exists, with thin film wedge fringes. [See also *Nature, Lond.*, 153, pp. 314–315, March 11, 1944].

535.42 = 3 1092

Diffraction of light at black screens. NOVOBATZKY, K. F. *Z. Phys.*, 119, 1–2, *pp.* 102–113, 1942.—The Kirchhoff integral equation is replaced by one which is more suitable for application and enables the state of polarization of the diffracted light to be determined.

H. G. S.

535.43 : 537.228.4 : 539.132 = 3 1093

On the dispersion of light and the Kerr constant of spherically symmetrical molecules. NEUGEBAUER, T. *Z. Phys.*, 119, 1–2, *pp.* 114–135, 1942.—The theory of light dispersion by asymmetrical molecules is dealt with by quantum mechanics. Connections between the degree of polarization and the Kerr effect are derived. The Voigt term and the polarization term of the Kerr effect are calculated. The dependence on frequency and temperature of these effects is discussed. The results are discussed and compared with experience. H. G. S.

535.434 1094

Scattering of light by small drops of water. RUEDY, R. *Canad. J. Res. A*, 21, *pp.* 99–109, *Dec.*, 1943.—When very small drops of water increase in size until their dia. is 1/4 of the wavelength of the incident light, they scatter the light according to Rayleigh's law for non-conducting particles. But when the dia. increases from $\lambda/4$ to $\lambda/2$, the intensity of light scattered along directions that point toward the source $\rightarrow 0$, the change being most marked betw. $2a/\lambda = 1/4$ and $2a/\lambda = 3/8$. The sharp increase in the proportion of scattered light with an increase in size, according to the (radius)^6, continues in the directions along which the main part of the scattered light is radiated by the particle. As the scattering begins to deviate from that given by Rayleigh's law, colours other than blue appear; the dispersion of the colours increases with increasing size of the particles until mainly red light remains.

535.434.08 : 621.383 1095

Photo-electric measurement of the intensity of scattered light. PARANJPE, G. R., AND TAMHANKAR, R. V. *J. Univ. Bombay*, 12, *pp.* 85–88, *Nov.*, 1943.—A circuit of the balanced photocell type, as described, was found to have the most suitable sensitivity and stability for measuring the very feeble intensity of light scattered in the horizontal plane by a cloud of water droplets.

N. M. B.

535.55 : 532.517.2 = 3 1096

The dependence on temperature of the flow birefringence of benzol. WINKLER, E. *Z. Phys.*, 118, 3–4, *pp.* 232–249, 1941.—The flow birefringence of benzol is measured over the temperature range from the melting point to the boiling point for a number of speeds of rotation of an outer cylinder, which, in contrast to the usual method, revolves around a stationary inner cylinder. With this arrangement the flow remains laminar at high speeds, testing optically is simplified, and smaller effects can be measured. Constructional details are given with drawings and illustrations. Within the last 10° above the solidification point a strong increase is found in the Maxwell constant. H. G. S.

535.55 : 621.882 1097

A photo-elastic study of bolt and nut fastenings. HETÉNYI, M. *J. Appl. Mech.*, 10, *A*93–*A*100, *Sept.*, 1943.—Six different nut designs were investigated by the 3-dimensional stress-freezing method, obtaining the max. stress at the bottom of the threads for each design. By the application of either a tapered-thread nut or a nut with a tapered lip, the strength of the fastening can be increased by more than 30%.

535.551 : 620.171.5 1098

Studies in three-dimensional photo-elasticity. Stress concentrations in shafts with transverse circular holes in tension. Relation between two- and three-dimensional factors. FROCHT, M. M. *J. Appl. Phys.*, 15, *pp.* 72–86, *Jan.*, 1944.—[Abstr. 851 B (1944)].

535.65 1099

Geometric formulation of classical colour harmony. MOON, P., AND SPENCER, D. E. *J. Opt. Soc. Amer.*, 34, *pp.* 46–59, *Jan.*, 1944.—Attempts to formulate a scientific theory of colour harmony and disharmony. The underlying postulate is that there are pleasing intervals and so-called "ambiguous" intervals between colours (expressed on a uniform chromaticity difference scale). The pleasing intervals are identity (a very small interval), similarity and contrast. Numerical limits, based on the opinions of a small number of observers, are given on the Munsell notation.

J. W. T. W.

535.65 1100

Area in colour harmony. MOON, P., AND SPENCER, D. E. *J. Opt. Soc. Amer.*, 34, *pp.* 93–103, *Feb.*, 1944.—An extension of previous work on colour harmony [see Abstr. 1099 (1944)] to include considerations of the areas of the respective colour patches. It is found that a pleasing balance is obtained when the scalar moments of the patches about the adaptation point are equal or simple multiples of each other. The scalar moment is defined as the product of the area by the distance of the colour point from the adaptation point on the colour diagram. J. W. T. W.

535.653.8 1101

Graphical representation of small colour differences. MACADAM, D. L. *J. Opt. Soc. Amer.*, 33, *pp.* 675–

679, *Dec.*, 1943.—A comment on Wright's suggestion [Abstr. 384 (1944)]. The author points out that conclusions of both practical and theoretical value can be drawn from a knowledge of the geometrical properties of a true uniform chromaticity diagram and urges that it is therefore worth while to continue the search for such a diagram. J. W. T. W.

535.663 : 551.593 *see Abstr.* 1210

535.7 1102

Visual observations of quantum fluctuations of the tight field. VAVILOV, S. I. *J. Phys., USSR*, 6, 5, *pp.* 224–225, 1942.

535.7 1103

The eye and radiology. *Brit. J. Radiol.*, 17, *pp.* 65–69, *March*, 1944.—Abstracts of a discussion before a joint meeting of British Institute of Radiology and Institute of Physics, Nov. 20, 1943, containing the following: The eye and fluoroscopy, Bromley, J. F.; The limitations of the eye: their effect on the interpretation of the fluoroscopic image, Wright, W. D.; Radiographic aspects, Spiegler, G.

535.7 1104

A theory of the induced size effect. HOUSEHOLDER, A. S. *Bull. Math. Biophys.*, 5, *pp.* 155–160, *Dec.*, 1943.—A quantitative formulation of Ogle's induced size effect [Abstr. 2463 (1940)] is carried out on the following assumptions: (1) Vertical equality of the retinal images acts as a cue for locating the subjective median plane as opposed to the horizontal retinal disparities which serve for locating the subjective frontal plane. (2) This cue operates independently of such cues as are provided by ocular versions, and predominates when the versions are not great.

L. S. G.

535.8 1105

A new form of microfilm reader. SCHUSTER, E. H. J. *Nature, Lond.*, 153, *pp.* 155–157, *Feb.* 5, 1944.

535.8 1106

A precision optical bench. WALLIN, W., AND MAZAR, W. S. *Rev. Sci. Instrum.*, 15, *pp.* 9–11, *Jan.*, 1944.

535.81 : 666.22 1107

New types of optical glass. HAMPTON, W. M., BASTICK, R. E., AND WHEAT, W. N. *Nature, Lond.*, 153, *p.* 283, *March* 4, 1944.—A brief report on new glasses developed by Chance Brothers Ltd. [See Abstr. 2557 (1943)].

535.822.5 1108

Simplified ultra-violet microscopy. LAVIN, G. I. *Rev. Sci. Instrum.*, 14, *pp.* 375–376, *Dec.*, 1943.—A simplified technique employing the 2 537 Å Hg line as the light source is described. The line is isolated by means of a liquid filter (aq. $NiSO_4$-$CoSO_4$ solution). The image is focused on a willemite screen.

536.2 : 517.947.43 *see Abstr.* 1001

536.212.3 1109

On the thermal conductivity of the dielectrics at temperatures lower than the Debye temperature. POMERANCHUK, I. J. *J. Phys., USSR*, 6, 5, *p.* 225, 1942.

536.421 : 548.0 = 3 *see Abstr.* 1200

536.52 1110

A thermocouple method for the measurement of liquid-steel casting-stream temperatures. OLIVER, D. A., AND LAND, T. *J. Iron Steel Inst.*, [9 *pp.*], *March*, 1944. *Advance copy.*—A Pt/Pt-Rh thermocouple, lightly sheathed in silica, was allowed to protrude into the narrow part of the conical refractory lining of a runner box. The e.m.f. of the thermocouple was applied to a mains-driven high-speed amplifier and recorder, which showed that a steady temperature was attained in approx. 15 sec. The application of the method is illustrated by two investigations.

536.658 : 532.516 1111

The heat of adsorption of long-chain compounds and their effect on boundary lubrication. FREWING, J. J. *Proc. Roy. Soc. A*, 182, *pp.* 270–285, *March* 1, 1944.—[See Abstr. 3008 (1942)]. The frictional behaviour between mild-steel surfaces lubricated with solutions in white oil of long-chain halides, acids, α-substituted acids, esters, cyanide, thiocyanate and a nitro derivative was investigated under high loads at low speeds. A transition from smooth sliding to stick-slips occurs at a temp. characteristic of the particular solution. For each substance the transition temp. increases with conc. Each solution builds up, and is in equilibrium with, an adsorbed and oriented film of the polar compound on the surface. An equation is deduced relating the conc. and transition temp. with the heat of adsorption. The long-chain polar compounds are adsorbed by the interaction of their dipoles with the atoms in the metal surface.

536.662 : 547.21 : 541.66 *see Abstr.* 1195

536.7 : 539.1 *see Abstr.* 1143

536.7 : 548.0 : 531.19 *see Abstr.* 1025

536.7 : 669.71 1112

Thermal investigations on constitution and ageing of aluminium-copper alloys with low copper content. BORELIUS, G., ANDERSSON, J., AND GULLBERG, K. *IngenVetenskAkad. Handl., No.* 169, [38 *pp.*], 1943.—After a review of investigations on the ageing of Al-rich Al-Cu alloys, additional data obtained by thermal analysis up to 575°C. are given and a constitutional diagram is derived. Experiments are described for the determination of heat evolved during ageing of a series of very pure Al-Cu alloys. Small samples of these alloys were held at const. temperatures of 20° and 100°C. after being quenched. R. W. P.

536.791.2 : 546.291 : 532.62 *see Abstr.* 1049

537.12 : 537.591.8 : 530.145.6 *see Abstr.* 1022

537.122 : 530.145.63 1113

Interpretation of the spinning electron with bipolar co-ordinates. PAYNE, M. H. *Phys. Rev.*, 65, *pp.* 39–46, *Jan.* 1 *and* 15, 1944.—Definitions are developed for bipolar co-ordinates of a point on a sphere, and it is shown that these co-ordinates transform like Pauli spin-functions under rotations. A geometrical picture of the Pauli spin theory is obtained by assuming that the electron is a point mass with charge *e*, moving on a sphere with its motion expressed in terms of its bipolar co-ordinates, and observable only at 2 diametrically opposite points of its orbit. This allows an exact physical interpretation of the spin variable and Pauli spin operators. A. J. M.

537.2 : 530.145.6 *see Abstr.* 1019

537.2 : 537.591.2 : 538.69 : 530.145.6 *see Abstr.* 1020

537.212 : 621.315.21 : 517.77 : 517.544.2
see Abstr. 994

537.226.08 = 3 1114

Contributions to the theory of the so-called ellipsoid method of determination of permittivity. BJÖRNSTÄHL, Y. *Z. Phys.*, 118, 3–4, *pp.* 257–263, 1941.—The ellipsoid method of determining permittivity of liquids [Abstr. 1571 (1924) and 1161 (1925)] is discussed, and a new theory is advanced which removes its peculiar consequences. H. G. S.

537.226.1 : 539.133 1115

Relationship between dielectric constant of liquids and solids and dipole moments. JATKAR, S. K. K. *Nature, Lond.*, 153, *p.* 222, *Feb.* 19, 1944.

537.228.4 : 539.132 : 535.43 = 3 *see Abstr.* 1093

537.29 1116

The spinning and floating of light bodies in an electric field: development of an experiment of Sir Isaac Newton. RAYLEIGH, LORD. *Proc. Phys. Soc., Lond.*, 56, *pp.* 73–78, *March*, 1944.—Describes a repetition with modern apparatus, of an experiment by Newton.

537.29 : 541.182.5 : 576.311 1117

The action of various types of electric fields on the relative viscosity of the plasmagel of *Amoeba proteus*. ANGERER, C. A., AND WILBUR, K. M. *Physiol. Zool.*, 16, *pp.* 84–92, *Jan.*, 1943.—Quantitative data on the action of electric current on protoplasmic colloid being lacking, the cytoplasmic layer of *Amoeba proteus* was taken as the medium for these experiments. The results after exposures to either d.c. or a.c. electric fields or discharges from capacitors for known periods of time and at various known current densities are discussed. Amoeboid movement may occur when the viscosity of the plasmagel has been markedly decreased by exposure to a.c. C. J. G.

537.3 : 591.477 1118

Local galvanic reaction of the skin and its clinical application. WOHLSTEIN, E. *Dermatologica, Bâsle*, 82, *pp.* 1–20, 1940. *Abstr. in Biol. Abstr.*, 17, *Abstr.* 841, *Jan.*, 1943.—Experiments with rabbits, cats and men, confirmed in the main certain theories of Ebbecke about local galvanic reaction of the skin. The electrical conductivity for d.c. is markedly increased by the use of mechanical and chemical stimuli due to the lowered resistance of the skin against d.c. It is strictly reversible, but becomes more pronounced on repeated applications of stimuli. The reaction is independent of nervous influences, as seen in tests with applications of adrenalin and histamin and in experiments on decerebrated animals and thalamus cats. Ca injected intravenously decreases the reversibility after repeated stimulation, and ether impairs it. C. J. G.

537.311.33 1119

Voltage fluctuations in electronic semi-conductors. DAVIDOV, B. I. *J. Phys., USSR*, 6, 5, *p.* 230, 1942.

537.311.33 : 535.372 *see Abstr.* 1088

537.311.33 : 621.314.632 : 549.214 1120

The rectifying property of carborundum. KENDALL, J. T. *Proc. Phys. Soc., Lond.*, 56, *pp.* 123–129, *March*, 1944.—A technique is described for obtaining a non-rectifying carbon-carborundum contact. Experimental V/A curves are given for single rectifying contacts. These curves show that green and black carborundum are essentially different types of semiconductor. Experiment also shows that all the rectification takes place at the contact surface, and that any volume rectification (if it exists) is a second-order effect.

537.312.6 : 538.662.13 : 621.317.331 1121

The electric resistance at the Curie point of nickel. NILSSON, B. E. *Ark. Mat. Astr. Fys.*, 29*B*, 9, [7 *pp.*], 1942.—Measurements carried out in a specially constructed Hg vapour thermostat on two samples of Ni (one being the same as was used by Svensson), gave resistance curves showing a sharp kink at the Curie point, well defined within $\pm 0{\cdot}1$ or $0{\cdot}2$°C. The purer sample gave 362·0°C. as the temperature of the Curie point of pure Ni. The lower value of 355°C. given by the second sample is accounted for by its Cr content of 0·20%, which should, according to a diagram of Chevenard, lower the Curie point of Ni about 8 deg. C. A. W.

537.312.62 1122

On the intermediate state of supraconductors. LANDAU, L. D. *J. Phys., USSR*, 6, 5, *pp.* 225–226, 1942.

537.312.62 1123

Investigation of the intermediate state of a supraconducting sphere. SHALNIKOV, A. I. *J. Phys., USSR*, 6, 5, *p.* 226, 1942.

537.36 : 541.183.7 : 532.613 *see Abstr.* 1047

537.523.5 1124

On the formation of the hot spot in the arc. WEIZEL, W., AND ROMPE, R. *Z. Phys.*, 119, 5–6, *pp.* 366–373, 1942.—As indicated earlier [Abstr. 2207 (1940)] the low value of the cathode fall in consequence of the transverse contraction of the discharge near the cathode is an effect of the min. principle. The contraction, and consequently the fall in potential to the amount of the cathode fall, can be interpreted from considerations of radial expansion and non-uniform thermal and electrical conditions. H. G. S.

537.525 : 539.231 = 3 *see Abstr.* 1167

537.525.6 1125

Characteristics of the positive column of a helium discharge. KARALINA, N. A. *J. Phys., USSR*, 6, 5, *pp.* 218–223, 1942.—In the pos. column of a He discharge the dependence of the potential gradient, of the electron temp. and of the conc. of electrons, on the product (radius of column) × (gas pressure) was investigated. The comparison of the experimental data with the calculations, carried out on the basis of the theory of a l.p. plasma, shows that this theory is available in the calculation of the characteristics of the discharge.

537.533.72 1126

Refractive index in electron optics. OPATOWSKI, I. *Phys. Rev.*, 65, *pp.* 54–55, *Jan.* 1 *and* 15, 1944.—To apply optical methods to electron optics, it is necessary to know the refr. index of the corresponding optical problem. A general formula for μ in terms of electrostatic potential V, and magnetic vector potential $\mathbf{A}$ is known, but if $\mathbf{A} \neq 0$, this formula involves a vector $\mathbf{S}$, parallel to the electron velocity, which is not, in general, known. The elimination of $\mathbf{S}$ by means of a momentum integral is generalized to include cylindrical fields, not necessarily symmetrical, and

some other types of field with a transversal field component. A. J. M.

537.533.72 : 621.385.833 = 3 1127

Fine-ray electron diffraction in the universal electron microscope. ARDENNE, M. VON, SCHIEBOLD, E., AND GÜNTHER, F. *Z. Phys.*, 119, 5–6, *pp.* 352–365, 1942.—The method of operating the 200 kV universal electron microscope in order to obtain fine-ray electron diffraction diagrams is explained, and examples are given of diagrams of gold-leaf preparations with ray diameters 1, 6, 15 and 150 μ, and films of nitrocellulose and other substances of importance in the chemistry of fibres. H. G. S.

537.533.74 = 3 1128

On the scattering of fast electrons at nuclei. URBAN, P. *Z. Phys.*, 119, 1–2, *pp.* 67–78, 1942.—The formula for the nuclear scattering is derived [see Abstr. 2983 (1932)]. It is shown to agree with experimental results, and is identical with that found by Sextl [Abstr. 2325 (1933)]. H. G. S.

537.533.79 1129

Effect of space charge on electron beams. AHARONI, J. *Phil. Mag.*, 35, *pp.* 36–50, *Jan.*, 1944.—A new method is given for dealing with the effect of space charge on an electron beam as it emerges from an electron-optical system. The method is essentially a hydrodynamical one. Application is made to the case of the plane diode and a very long slit, a formula being obtained which is identical with that derived by Thompson and Headrick, using a totally different method. The cases of (*a*) a circular beam and (*b*) a rectangular slit of finite length are also discussed. A. W.

537.533.79 : 537.591 = 3 1130

On the Compton effect on mesons. ISKRAUT, R. *Z. Phys.*, 118, 3–4, *pp.* 181–198, 1941.—By a method similar to the Gordon and Sommerfeld method, the Compton effect on mesons is calculated in the non-relativistic boundary case and for radiation of not too short wavelength. As in the case of the particle without spin and the particle with spin 1/2, with mesons also the spin, in this approximation, exerts no influence on the scattered radiation. H. G. S.

537.533.8 : 537.591.8 *see Abstr.* 1136

537.534 1131

An independent determination of fixed points on the high-voltage scale. HANSON, A. O., AND BENEDICT, D. L. *Phys. Rev.*, 65, *pp.* 33–38, *Jan.* 1 *and* 15, 1944.—The paper attempts to establish more precisely the voltages of nuclear reactions which have been used as voltage calibration points. The abs. values of the proton energies obtained for the various calibration points are: 1·883 eMV for the Li(p, n) threshold, 2·058 eMV for the Be(p, n) threshold, 0·877 eMV for the first strong F(p, γ) resonance, and 0·4465 for the Li(p, γ) resonance.

537.534.74 : 539.185 : 539.152.1 *see Abstr.* 1145

537.534.8 : 535.14 *see Abstr.* 1065

537.534.9 : 539.185 : 539.152.1 *see Abstr.* 1146, 1147

537.564 : 537.591.8 = 3 *see Abstr.* 1137

537.58 : 533.7 *see Abstr.* 1052

537.581 : 546.841 : 546.883 : 541.183.1 *see Abstr.* 1194

537.591 : 537.533.79 = 3 *see Abstr.* 1130

537.591.1 1132

Soft and hard components of cosmic rays and the spin of the meson. ALICHANJAN, A. I., ALICHANOV, A. I., AND NIKITIN, S. *J. Phys., USSR*, 6, 5, *pp.* 230–232, 1942.

537.591.1 1133

Banded meson spectrum and the Rossi second maximum. AIYA, S. V. C. *Nature, Lond.*, 153, *p.* 375, *March* 25, 1944.

537.591.1 : 539.152.1 1134

Note on the production of cosmic-ray mesons. JÁNOSSY, L. *Phys. Rev.*, 64, *pp.* 345–349, *Dec.* 1 *and* 15, 1943.—The cross-sections for the production of mesons in collisions between heavy particles [Abstr. 2834 (1943)] are so large that a heavy particle crossing an atomic nucleus must be expected to collide several times inside the same nucleus. This hypothesis accounts for cloud-chamber observations showing the production of several mesons in one point. Anti-coincidence experiments of Jánossy and Rochester can also be interpreted easily by the theory when the occurrence of multiple collisions is assumed.

537.591.2 : 537.2 : 538.69 : 530.145.6 *see Abstr.* 1020

537.591.3 = 3 1135

Measurement of the soft cosmic-ray component behind different materials for determining the amount of the decay electrons. SIEGERT, B. *Z. Phys.*, 118, 3–4, *pp.* 217–231, 1941.—An experimental determination of the number of decay electrons and their secondaries from the difference of the soft and hard components in air, and after passing through water, coal and iron. The method employed is given in detail. The ratio of the soft to the hard component in air is 0·32, after passing through water and coal 0·20 and through iron 0·16. From the number of the decay electrons per meson the mean decay time of the mesons is $\tau = 3{\cdot}5 \times 10^{-6}$ sec. H. G. S.

537.591.8 : 530.145.6 *see Abstr.* 1021

537.591.8 : 537.12 : 530.145.6 *see Abstr.* 1022

537.591.8 : 537.533.8 1136

Effect of screening on the bremsstrahlung and pair-creation process and its consequence on the cascade theory. CHAKRABARTY, S. K. *Proc. Nat. Inst. Sci. India*, 9, 2, *pp.* 323–335, 1943.—Expressions for the cross-sections of the pair-creation and bremsstrahlung processes have been obtained, allowing for incompleteness of screening, and they have been used in calculating the number of cascade electrons and positrons in different materials at any depth below the top, and also the energy spectra of these particles. The cascade depends on the nature of the material in which the shower is produced. The max. of the shower transition curve is displaced to greater depths in heavier materials. [See Abstr. 1976 (1943)]. A. J. M.

537.591.8 : 537.564 = 3 1137

On the proof of nuclear disintegration of cosmic radiation with the ionization chamber. HOFFMANN, G. *Z. Phys.*, 119, 1–2, *pp.* 35–42, 1942.—The formation of ions by cosmic radiation is investigated in a large ionization chamber by rapid separation and amplification, and by slow separation and electrometer. In both cases the thin-walled chamber is filled with N_2 at atm. pressure and has a capacity of about 0·25 m.^{3} The ions separated by collisions are produced essen-

tially by air showers, with superimposed effects due to protons and heavy nuclear fragments. The results agree with Euler's work [Abstr. 813 (1942)]. H. G. S.

537.591.8 : 539.172 *see Abstr.* 1158

538.2 1138

"Magnetic" current. KENDALL, J. T. *Nature, Lond.*, 153, *pp.* 157–158, *Feb.* 5, 1944.—The author has repeated Ehrenhaft's experiments as described in the Press. The experiments demonstrate conclusively that the movement of the liquid, disclosed by refr. index striations, depends on the presence of ferrous or other ions of high magnetic susceptibility. A. E. T.

538.32 = 3 1139

Calculation of the forces on cylindrical conductors in plane electrostatic and electromagnetic fields. MÜLLER, W. *Ann. Phys., Lpz.*, 42, 7–8, *pp.* 609–633, 1942–1943.—General laws and formulae are developed for the forces on single conductors and between pairs of cyl. conductors, using fractional methods which have been elaborated particularly for hydrodynamic problems. E. R. A.

538.615 = 3 1140

Zeeman effect in the field range above 50 000 gauss. BACK, E., AND BEZLER, R. *Z. Phys.*, 114, 5–6, *pp.* 257–264, 1939.—The air gap between the soft-iron pole-pieces of the Weiss electromagnet was reduced from 4 mm. to 0·4 mm. whereby the field in the slit was raised from 38 500 to 50 100 gauss. At this field intensity, with a new light source for gas discharges requiring a slit 0·4 mm. wide, more accurate results are obtained for the A spectrum, leading to a widening of the region of Zeeman-effect research. H. G. S.

538.615 = 3 1141

Zeeman effects of the A II spectrum with 55 000 gauss. BEZLER, R. *Z. Phys.*, 116, 7–8, *pp.* 480–494, 1940.—[See Abstr. 1140 (1944)]. With pole-pieces of Fe-Co alloy instead of soft iron, the Zeeman effects of the 81 A II lines were investigated. Tabulated data are given, with analysis. H. G. S.

538.652 = 3 1142

On the "remanence" of the magnetostriction of polycrystalline iron and nickel. KIRNETZKI. *Ann. Phys., Lpz.*, 43, 3, *pp.* 203–219, 1943. *Abstr. in Wireless Engr*, 21, *p.* 46, *Jan.*, 1944.—The investigation deals theoretically and experimentally with tests on long, thin samples having very small demagnetizing factors; this type of remanence plays an important part in the damping of mechanical oscillations by magneto-mechanical hysteresis. E. R. A.

538.662.13 : 621.317.331 : 537.312.6 *see Abstr.* 1121

538.69 : 537.591.1 : 537.2 : 530.145.6 *see Abstr.* 1020

539.1 : 536.7 1143

Number of configurations of molecules occupying several sites. GUGGENHEIM, E. A. *Nature, Lond.*, 153, *p.* 255, *Feb.* 26, *and pp.* 406–407, *April* 1, 1944.

539.132 : 537.228.4 : 535.43 = 3 *see Abstr.* 1093

539.133 1144

Dipole moments of polyatomic molecules. JATKAR, S. K. K. *Nature, Lond.*, 153, *pp.* 316–317, *March* 11, 1944.

539.133 : 537.226.1 *see Abstr.* 1115

539.152.1 : 537.591.1 *see Abstr.* 1134

539.152.1 : 539.185 : 537.534.74 1145

Nuclear forces in a non-symmetrical scalar pseudoscalar meson field theory. HULTHÉN, L. *K. Fysiogr. Sällsk. Lund. Förh.*, 14, 2; [4 *pp.*], *Jan.* 14, 1944.—By describing neutral and charged mesons by different kinds of fields it is possible to construct a theory of nuclear forces which gives the correct properties of deuterons, and shows the approx. charge-independence required by experiments on proton-proton scattering. [See Abstr. 1147 (1944)]. A. J. M.

539.152.1 : 539.185 : 537.534.9 1146

On the meson field theory of nuclear forces and the scattering of fast neutrons by protons. HULTHÉN, L. *Ark. Mat. Astr. Fys.*, 29*A*, 33, [22 *pp.*], 1943.—The paper deals principally with the application of the symmetrical theory of nuclear forces to the problem of the deuteron and the scattering of high-energy neutrons by protons. First-order relativistic effects are not small in the ground state of the deuteron. The quadrupole moment of the deuteron and the angular distribution of high-energy neutrons scattered by protons are dealt with.

539.152.1 : 539.185 : 537.534.9 1147

On the meson field theory of nuclear forces and the scattering of fast neutrons by protons. II. HULTHÉN, L. *Ark. Mat. Astr. Fys.*, 30*A*, 9, [16 *pp.*], 1943.—The plane-wave solutions of the Kemmer equation for the nuclear two-body problems as far as relativistic effects are concerned, are considered. The variation of the angular distribution with different dependence of interaction on distance is considered, and a possible non-symmetrical theory is mentioned. [See Abstr. 1146 (1944)]. A. J. M.

539.153.4 = 3 1148

Calculation of several terms of the Na and K atoms and of the ground term of the Al^+ and Al^{++} ions. KOZMA, B., AND KÓNYA, A. *Z. Phys.*, 118, 3–4, *pp.* 153–163, 1941.—With the aid of the Gombás approximation method [Abstr. 1149 (1944)] the 3*S*, 4*S*, 3*P*, 4*P*, 3*D* terms of the Na atom, the 4*S*, 4*P*, 3*D*, 4*F*, 5*G* terms of the K atom and the ground term of the Al^+ and Al^{++} ions are calculated with the corresponding eigenfunctions. The results, which agree with the empirical values, are discussed. H. G. S.

539.153.4 = 3 1149

On a simplified formulation of the distribution law of the quantum states of atoms and its application to the determination of the atomic terms. GOMBÁS, P. *Z. Phys.*, 118, 3–4, *pp.* 164–180, 1941.—A statistical formulation of the distribution law of the quantum states of an atom fully occupied by the core electrons, which the valence electrons are prevented from occupying by the force of repulsion exerted on them by the core electrons. This force has a potential for which a simple expression is derived. The results obtained by the approximation method developed of the terms and eigenfunctions agree with experience. [See also Abstr. 1148 (1944)] H. G. S.

539.153.4 : 541.56 = 3 1150

On the calculation of atomic terms. GOMBÁS, P. *Z. Phys.*, 119, 5–6, *pp.* 318–324, 1942.—The calculation of atomic terms on the basis of the simplified formulation of the position rule of the quantum states of atoms [Abstr. 1149 (1944)] is extended by taking

nto account the exchange interaction of the valence electrons with the core electrons. A simple formula s derived by which an approx. value of the energy xchange can be determined, as shown in connection vith some terms of the Na, K and Ca atoms and Al^+, Al^{2+} and Ca^+ ions. H. G. S.

539.155 : 53.081 *see Abstr.* 1014

539.155.2 : 533.15 : 535.336.2 *see Abstr.* 1075

539.155.2 : 539.163.2 : 546.77 = 3 1151

Investigation of the 19-minute isotope of molybdenum and the resulting isotope of element 43. MAURER, W., AND RAMM, W. *Z. Phys.*, 119, 5–6, *pp.* 334–351, 1942.—The complex nature of the 24 min. activity of Mo [*Phys. Rev.*, 57, p. 750, 1940] is confirmed. But the half-value times differ and are (14·6 ± 0·3) min. for the Mo mother substance and (14·0 ± 0·3) min. for the element 43. β- and γ-absorption measurements give a β limit of 1·3 eMV for the element 43 and a γ radiation of 300 ekV for Mo, probably at least 2 β-limits with the approx. energy values of 2·2 and 1·0 eMV and a γ radiation of 0·9 and eventually 0·3 eMV. H. G. S.

539.16.08 1152

Rate of *n*-fold accidental coincidences. JÁNOSSY, L. *Nature, Lond.*, 153, *p.* 165, *Feb.* 5, 1944.

539.163 : 546.94 1153

Radioactivity in osmium. LOUGHER, E. T., AND ROWLANDS, S. *Nature, Lond.*, 153, *pp.* 374–375, *March* 25, 1944.

539.163.2 : [546.18 + 546.33] 1154

β-radiation from active phosphorus and sodium. SIEGBAHN, K. *Nature, Lond.*, 153, *p.* 221, *Feb.* 19, 1944.

539.163.2 : [546.711 + 546.73] 1155

Disintegration schemes of radioactive substances. VI. Mn^{56} and Co^{56}. ELLIOT, L. G., AND DEUTSCH, M. *Phys. Rev.*, 64, *pp.* 321–331, *Dec.* 1 *and* 15, 1943.—The radiations accompanying the decay of Mn^{56} and of Co^{56} were studied by magnetic-lens spectrometer and coincidence methods. Both nuclei decay to stable Fe^{56}. Four excited states of the Fe^{56} nucleus are established with excitation energies 0·845 eMV, 2·11 eMV, 2·66 eMV and 2·98 eMV respectively. The negatron spectrum of Mn^{56} consists of 3 groups of max. energies 2·86 eMV, 1·05 eMV and 0·73 eMV, repectively, and rel. abundance 60 : 25 : 15. The positron spectrum of Co^{56} consists mainly of a single group of max. energy 1·50 eMV. The energies of 8 γ-rays emitted by the Fe^{56} nucleus are determined. All of the β-ray spectra seem to have the "allowed" shape of the Fermi theory. The significance of this and of the rel. probability of orbital electron capture is discussed in terms of the tensor interaction.

539.163.2 : 546.77 : 539.155.2 = 3 *see Abstr.* 1151

539.163.2 : 546.793.2 = 3 1156

β-decay of radium-A. LABHART, H., AND MEDICUS, H. *Helv. Phys. Acta*, 16, 4, *pp.* 392–406, 1943.—Two counter-tube methods for detecting β-ray activity of Ra-A failed to indicate any β-rays emitted by this element, the max. ratio of β/α being 0·35%. A. J. M.

539.163.2 : 546.815 = 3 1157

Resonance absorption of 2·62 eMV γ-rays in lead. ZUBER, K. *Helv. Phys. Acta*, 16, 4, *pp.* 407–414, 1943.—The conditions necessary for the observation of a resonance absorption by atomic nuclei, in addition to the normal absorption of γ-rays by Pb, are discussed. The use of a radioactive source of γ-rays for this purpose is unsuitable. Experiments on the absorption of scattered radiation, emitted from Pb, by Hg and Pb are described. The oscillator strength, f, for the transition concerned, lies between 10^{-4} and 10^{-3}. A. J. M.

539.172 : 537.591.8 1158

Nuclear disintegrations produced by cosmic rays. GOLDHABER, M. *Nature, Lond.*, 153, *pp.* 221–222, *Feb.* 19, 1944.

539.172 : 541.141 1159

Radiochemistry. A review of recent progress. ALLSOPP, C. B. *Trans. Faraday Soc.*, 40, *pp.* 79–87, *Feb.*, 1944.—In the initiation of radiochemical reactions in gaseous systems, excitation of molecules is more important than ionization. Radiochemical reactions in dilute aq. solution are an indirect result of the absorption of radiation, and require the presence of activators. Physico-chemical effects of radiations on colloidal solutions are electrical in origin.

539.181 : 535.31 : 548.0 = 3 1160

On the theory of the anomalous reflection of atomic rays at crystal surfaces. I–IV. ARTMANN, K. *Z. Phys.*, 118, 9–10, *pp.* 624–658; 118, 11–12, *pp.* 659–676; 119, 1–2, *pp.* 49–66, *and* 119, 3–4, *pp.* 137–153, 1942.—The anomalous intensity min. observed by Frisch and Stern with regularly reflected He rays which occurs at azimuth values, are treated wave-optically. The calculated position agrees with observation. The effect of faulty monochromatism of the atomic ray on the shape is investigated. Linear equations are established and solved for the intensities of the reflected waves within the layer between the crystal surface and the plane surface of separation. For grazing incidence the theoretical width of the minima agrees with the observed, but not for steep incidence. The discrepancy arises from the disregard of the energy exchange between lattice and atomic ray. When the energy exchange between lattice and particle is taken into consideration agreement is reached between the theoretical and observed form. A method of determining the frequency of the lattice vibrations is given. H. G. S.

539.185 1161

Inelastic scattering of slow neutrons. WEINSTOCK, R. *Phys. Rev.*, 65, *pp.* 1–20, *Jan.* 1 *and* 15, 1944.—The total polycrystalline elastic- and inelastic-scattering cross-sections are computed by the Born approximation with use of the Fermi (δ function) interaction between slow neutrons and bound nuclei. Isotopic disorder and magnetic interaction are neglected. Numerical calculation for iron scattering 300 deg. neutrons yields an inelastic cross-section which rises from 0·006 at 0°K. to 0·192 at 1 000°K., in units of the free nuclear elastic-scattering cross section. The total cross-section remains const. up to 250°K. but falls off from 0·97 at 0°K. to 0·90 at 1 000°K.

539.185 : 537.534.74 : 539.152.1 *see Abstr.* 1145

539.185 : 537.534.9 : 539.152.1 *see Abstr.* 1146, 1147

539.211 : 553.621 : 548.0 *see Abstr.* 1201

539.211 : 620.179.6 1162

Surface finish. CLAY, W. E. R. *Auto. Engr*, *pp.* 73–78, *Feb.*, 1944.—Surface-finish measurement is a necessary adjunct to dimensional control. Types of apparatus are described, ref. being made to the T.T.H."Talysurf." Surface-finish standards and standardization are established and the effects of surface-finish improvement summarized. See also *J. Instn Auto. Engrs*, 12, pp. 9–23, Feb., and pp. 8–23, March, 1944. M.-V.

539.211 : 621.92 : 549.211 1163

Diamond tools for piston turning. *Industr. Diamond Rev.*, 4, *pp.* 29–32, *Feb.*, 1944.—An instrument for measuring and recording surface finish is described. Two indications are given by the machine—a reading of the average height of the undulations on a meter, and a graph showing the size, shape and depth of the undulations. The machine can be set to give magnifications up to × 40 000 (vertical) and 200 (horizontal).

539.215.4 1164

Highly dispersed abrasive powders. KOIFMAN, M. J. *Industr. Diamond Rev.*, 4, *pp.* 39–44, *Feb.*, 1944.—The paper contains a discussion on the structure and systems of classification of abrasive powders. The basic characteristics and the technical properties of these substances depend on mechanical analysis (precision and purity of classification), mineral composition, wetting power, efficiency and stability. The most important problems now confronting this industry are the improvement of properties and the standardization of production, and these may be accomplished by precision of classification, reduction in the pollution of powders by large and small fractions, max. homogeneity, and the correct correspondence of the powders to a given nomenclature.

H. H. HO.

539.217 : 532.62 : 632.94 1165

Determination of permeability of agricultural spray coatings to water vapour. COMAR, C. L., AND MILLER, E. J. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 737–740, *Dec.* 15, 1943.—Measurements and illustrative data are reported for a simple empirical method, using the Payne permeability cup, giving reproducible measurements on films of wax and oil-spray emulsions of the oil-in-water type. There is a linear relationship between moisture impedance and film thickness. Advantages in the use of paraffin wax, and the rôle of bentonite in the emulsion, are indicated.

N. M. B.

539.217.5 : 676 1166

Paper: air permeability: determination. *Paper Tr. J.*, 117, *TAPPI*, *pp.* 129–130, 1943. *Abstr. in J. Text. Inst.*, 34, *p. A*708, *Dec.*, 1943.—The instrument consists of an outer cylinder partly filled with oil, and an inner cylinder with closed top, sliding freely in the outer. The instrument furnishes air pressure to the paper sample, held between clamping plates having a circular orifice of 1 in.^{2} The average number of sec. required for the displacement of 100 ml. of air through an area of 1 in.^{2} of the paper is reported as the air permeability. E. R. A.

539.219.1 : 546.98 : 546.11 : 548.73 *see Abstr.* 1204

539.231 : 537.525 = 3 1167

New investigations on the cathode sputtering of the glow discharge. I. The primary vaporization of Cu. II. The determination of the fringing factor. III. The incomplete covering of the cathode of the anomalous glow discharge. IV. The spreading of the primary vaporized particles. GÜNTHERSCHULZE, A. *Z. Phys.*, 118, 3–4, *pp.* 145–152, 1941, *and* 119, 1–2, *pp.* 79–99, 1942.—The conditions to be fulfilled, the procedure adopted and the apparatus used, together with the experimental results obtained, in making measurements of exact values of the sputtered quantities are described in detail. H. G. S.

539.234 : 539.378.3 1168

Anisotropy of metals. COLEMAN, H. S., AND YEAGLEY, H. L. *Phys. Rev.*, 65, *pp.* 56–57, *Jan.* 1 *and* 15, 1944.—Anisotropy in the inter-diffusion of two metals indicates that orientation may be the primary factor controlling the rate. There is a close connection betw. crystal structure, plastic deformation, ferromagnetism, growth nucleation of metals and inter-diffusion. A. J. M.

539.234 : 548.5 : 541.124 = 3 1169

On the reaction rate at the disorder-order transition of pure metal films. SUHRMANN, H., AND SCHNACKENBERG, H. *Z. Phys.*, 119, 5–6, *pp.* 287–317, 1942.—Thin films (10–100 mμ) of Ni, Fe, Cu, Ag, Au, Pb and Bi were vaporized and condensed in high vacuum on glass cooled with solid N_2 (64°K.). Each layer was heated successively to 77·5°K., 182·5°K. and room temp. and the change in the resistance with time investigated at each of the temperatures maintained const. The resistance/time curves can be represented by a hyperbolic relationship, which is explained, and an empirical formula is established. The crystallization of the metal layers in the state of disorder, which is comparable with the crystallization of a sub-cooled melt, can be regarded as a quantum process. H. G. S.

539.26 : [546.86 + 546.23] = 3 1170

The structure of explosive antimony and vitreous selenium. HENDUS, H. *Z. Phys.*, 119, 5–6, *pp.* 265–286, 1942.—The *d*-values of the first 4 X-ray interferences observed of explosive Sb with Mo and Cu radiation are 3·01, 1·92, 1·43 and 1·27 Å. The atomic distribution by Fourier analysis from the X-ray intensity curves shows that explosive Sb has a liquid structure closely resembling that of crystalline Sb as regards the co-ordination numbers and atomic spacings (2·87, 3·51, 4·18 and 6·26 Å). The structure of vitreous Se is obtained similarly, but only Cu radiation was used. The *d*-values of the 3 interferences observed are 3·32, 1·79 and 1·13 Å. The Fourier analysis gives 2 max. in the atomic distribution at a spacing of 2·37 and 3·67 Å. H. G. S.

539.26 : 620.179.152 : 621.386.1 1171

The technique of microradiography. MADDIGAN, S. E. *J. Appl. Phys.*, 15, *pp.* 43–54, *Jan.*, 1944.—[Abstr. 992 B (1944)].

539.319 : 621.791.75 1172

Welding contraction. *Welding*, *pp.* 110–112, *Feb.*, 1944.—The causes of residual stresses, means for keeping them within safe limits and circumstances under which they increase, are discussed. It has been suggested that "lock-up" stresses tend to relieve themselves by local plastic deformation at the points where the stress is over the elastic limit, but the author gives reasons to show that this theory is fallacious. M.-V.

539.378.3 : 539.234 *see Abstr.* 1168

539.382 1173

Exploring stress/strain relations of isotropic plastic solids. PRAGER, W. *J. Appl. Phys.*, 15, *pp.* 65–71, *Jan.*, 1944.—A method of representing graphically the results of torsion and tension tests of thin-walled tubes is used to discuss, in geometrical terms, some stress/strain relations of the mathematical theory of plasticity. The theories of de Saint-Venant, Lévy and v. Mises lead to physically inacceptable conclusions unless the material is supposed to be rigid as long as the stresses have not reached the yield limit. The predictions of the theories of Prandtl, Reuss, Hencky and Nádai are compared with the results of experiments on mild steel; the possible effects of viscosity and strain hardening are discussed.

539.382 : 669.14 1174

Effect of strain rate upon plastic flow of steel. ZENER, C., AND HOLLOMON, J. H. *J. Appl. Phys.*, 15, *pp.* 22–32, *Jan.*, 1944.—An experiment was designed to check a proposed equivalence of the effects of changes in strain rate and in temperature upon the stress/strain relation in metals. This equivalence is valid for the typical steels investigated; their behaviour at high rates of deformation may, therefore, be obtained by tests at moderate rates at low temperatures. The results of such tests are described. An increase of strain rate tends to change the conditions from isothermal to adiabatic. At low temperatures, the adiabatic stress/strain relation in the plastic range is different from the isothermal, having an initial neg. slope.

539.382 : 669.3 1175

Increase of stress with permanent strain and stress/strain relations in the plastic state for copper under combined stresses. DAVIS, E. A. *J. Appl. Mech.*, 10, *A*187–*A*196, *Dec.*, 1943.—Annealed-copper specimens in the shape of hollow cylinders were tested by subjecting them to combined axial tension and internal pressure. A given internal-pressure/axial-load ratio was maintained in each test, but for different tests this ratio was varied. The results are used to study plastic strain increase with increasing stress and to determine the relations betw. the 3 principal strains at any instant.

539.382 : 678 1176

Stress/strain data for vulcanized rubber under various types of deformation. TRELOAR, L. R. G. *Trans. Faraday Soc.*, 40, *pp.* 59–70, *Feb.*, 1944.—[See Abstr. 256 (1944)]. Stress/strain data are given for an 8% S rubber and a latex rubber. The types of deformation studied were simple elongation, 2-dimensional extension (or compression), pure shear and combined elongation and shear. Comparison with the theoretical relations based on the molecular-network model shows the agreement to be good for the 2-dimensional extension, but less good for simple elongation and shear. The effect of combined elongation and shear is satisfactorily accounted for. The theory provides a satisfactory explanation of rubberlike elasticity, and forms a useful basis for the description of the mechanical properties of rubber subjected to large deformations of any type.

539.384 1177

Mechanics of sheet-metal bending. SCHROEDER, W. *Trans. Amer. Soc. Mech. Engrs*, 65, *pp.* 817–827, *Nov.*, 1943.—Discusses the basic mechanical phenomena occurring during the bending of sheet material. Analytical methods are given whereby all aspects of behaviour during and after bending (forming pressure and springback) can be predicted on the basis of the stress/strain diagram of the material. An experimental and analytical study of the strain distribution in the bend is included.

539.4.013 : 666 1178

The effect of shape on the thermal endurance of glass rods. MURGATROYD, J. B. *Phil. Mag.*, 35, *pp.* 17–29, *Jan.*, 1944.—[See Abstr. 2399 (1943)].

539.4.016.3 : 669.3 : 621.315.5 1179

The inter-relation of age-hardening and creep performance. II. The behaviour in creep of an alloy containing 3% nickel and silicon in copper. JENKINS, C. H. M., BUCKNALL, E. H., AND JENKINSON, E. A. *J. Inst. Met.*, 70, *pp.* 57–79, *Feb.*, 1944.—[See Abstr. 845 B (1936)]. Different thermal treatments bring about ageing in the alloy and render possible a comprehensive survey of its properties in rel. to age-hardening or age-softening in the range 15°–625°C. In long-time tests betw. 230° and 600°C., fully age-hardened material is markedly inferior to fully softened material, but in short-time tests the converse holds. The rupture of tensile and creep specimens in the range 300°–500°C. results from the development of intercrystalline cracks, whereas at lower temperatures transcrystalline fractures are found. In fully softened material there is appreciable lengthening of the crystals before the intercrystalline form of cracking begins to develop.

539.4.019 1180

Effect of temperature upon the mechanical properties of rubber-like materials. FLETCHER, W. P. *Nature, Lond.*, 153, *pp.* 341–342, *March* 18, 1944.

539.434 1181

Failure from creep as influenced by the state of stress. SIEGFRIED, W. *J. Appl. Mech.*, 10, *A*202–*A*212, *Dec.*, 1943.—The author discusses studies relating to the occurrence of brittle fractures in metals after long periods of time, and attempts to reconcile discrepancies between recent observations of intercrystalline fractures after long tests. A basis is furnished for determining the risk of failure with creep in a 3-dimensional system of stress. G. E. A.

539.501 1182

Comparison of the behaviour of rubber-like materials under constant stress and constant strain conditions. BLAIR, G. W. S., AND VEINOGLOU, B. C. *Nature, Lond.*, 153, *pp.* 165–166, *Feb.* 5, 1944.

539.501 : 541.18 1183

Rheological properties of colloidal solutions, pigment suspensions, and oil mixtures. WELTMANN, R. N., AND GREEN, H. *J. Appl. Phys.*, 14, *pp.* 569–576, *Nov.*, 1943.—The validity of the Arrhenius viscosity/conc. law is examined for relatively conc. colloidal solutions and, in particular, for the plasticity conc. region. Exponential laws similar to the Arrhenius law are found for plastic viscosity and vol. % of pigment and also for yield vals. in the medium-high conc. region; from these equations any desired mixture can be calculated. The viscosities of oil mixtures increase logarithmically with the vol. % of one of the

oil constituents below, but not above, the "limiting rate of shear." N. M. B.

539.6 1184

Influence of an adsorbed (inner) layer on the cohesion of a solid. BANNISTER, L. C. *Nature, Lond.*, 153, *pp.* 315–316, *March* 11, 1944.—[See Abstr. 942 (1944)].

539.62 : [621.85 + 621-752 + 534.11 + 621.92] 1185

Frictional phenomena. XVI. GEMANT, A. *J. Appl. Phys.*, 14, *pp.* 510–521, *Oct.*, 1943.—Technical applications of the external friction of solids are discussed. It is shown how friction is utilized and some principles of design and numerical data are added. In belt drives, leather and rubber have the highest coeff. of friction; V-belts increase the effective friction. Forms of clutch include the disc, cone, block, expanding ring and band. In motor-car brakes the temperature resistance of the facing material is as important as the friction coeff. and the wearing property, a safe limit of temperature being 150°F. for leather or wood, and 350°F. for asbestos on cast iron. The principle of the Lanchester damper for reducing torsional vibrations in shafts is given. Under self-excited vibrations are included shaft whipping in a loose bearing, effect of the bow on a violin string and the squeaking of doors. The connection of friction with the processes of grinding and crushing is also discussed. G. E. A.

539.62.08 : 677 1186

A friction meter for determining the coefficient of kinetic friction of fabrics. DREBY, E. C. *J. Res. Nat. Bur. Stand., Wash.*, 31, *pp.* 237–246, *Oct.*, 1943.—The disadvantage of having to balance the frictional force by varying the applied force by increments is overcome by continuous spring-tension balancing. The new apparatus is suitable for routine testing. Its construction and operation are described, and the factors affecting the measurement of the coeff. of friction and the relation of the latter to the smoothness and "hand" of fabrics are discussed. A. F. T.

541.124 : 548.5 : 539.234 = 3 *see Abstr.* 1169

541.127 : 546.11 : 546.172.6 1187

The mercury-sensitized reaction between hydrogen and nitric oxide. TAYLOR, H. A., AND TANFORD, C. *J. Chem. Phys.*, 12, *pp.* 47–52, *Feb.*, 1944.—The rate at const. NO pressure is $\propto$ the H at low H pressures, the effect diminishing at higher conc. With a given H conc. NO is almost without effect until an excess is present, when it shows a retardation. At const. total pressure a max. rate occurs with a particular excess of H.

541.127.1 : 541.128.3 : 662.66.094 1188

Hydrogenation and liquefaction of coal. IV. Effect of temperature, catalyst and rank of coal on rates of coal-hydrogenation reactions. STORCH, H. H., FISHER, C. H., HAWK, C. O., AND EISNER, A. *Techn. Pap. U.S. Bur. Min., No.* 654, [50 *pp.*], 1943.—Extensive data are reported and discussed for experiments in rotating autoclaves on (*a*) rate of H absorption, (*b*) O removal and coal liquefaction, (*c*) formation of hydrocarbon gases, CO_2, NH_3 and H_2S. There is no direct relation between (*a*) and (*b*); (*a*) depends mainly on temp. but (*b*) can take place at fairly low temps. Data on the rate of formation of hydrocarbon gases are approx. similar to (*a*), those on rate of CO_2 formation are similar to (*b*), but those on rates of NH_3 formation differ markedly from the others; explanations are proposed. Kinetics and mechanisms of reactions are discussed. Effect of rank on the rates of hydrogenation is examined for 2 lignites and 3 bituminous coals. There is evidence that coals containing $\sim$ 82% C represent a critical point in the coalification process and in the change in structure that occurs during metamorphism. N. M. B.

541.128.3 1189

The properties of chromic oxide gel and its catalytic activity for the aromatization of *n*-heptane. DICKINSON, E. J. *Trans. Faraday Soc.*, 40, *pp.* 70–79, *Feb.*, 1944.—The reduction of Cr_2O_3 gel by H, the action of O_2 and water on the reduced gel. and the action of *n*-heptane on both the oxidized and reduced forms, were investigated at l.p. At 450°C. dry H reduces the oxide to a limited extent, and some H_2 is irreversibly adsorbed. At 800°C. the irreversible adsorption is small, the extent of reduction is $>$ at 450°C. At 450°C. O oxidizes the reduced gel completely and removes any combined H as water. Water oxidizes a small fraction of the reduced gel at 450°C., and a proportion is reversibly adsorbed. The most effective regeneration treatment was heating with O_2 and then H_2 at 600°C.

541.128.3 : 662.66.094 : 541.127.1 *see Abstr.* 1188

541.132 = 3 1190

On dissociation of isotopic molecules. GERÖ, L., AND SCHMID, R. *Z. Phys.*, 118, 3–4, *pp.* 250–256, 1941.—Slightly differing potential curves must be assumed for isotopic molecules in the sense of a slightly higher stability of the deuterides. This accords with band spectroscopic results, e.g. with the smaller internuclear distances in the deuterides compared with the hydrides. H. G. S.

541.135 1191

The temperature coefficient of the diffusion constant of copper in aqueous solutions of sulphuric acid containing copper sulphate. PATTERSON, W. A., AND BURT-GERRANS, J. T. *Canad. J. Res. B*, 22, *pp.* 5–15, *Jan.*, 1944.—Values of the temp. coeff. are given for 10°–25°C. and 4 acid conc. Evidence is presented supporting the choice of a new point on the oscillograph potential curve for the measurement of t. The values of K at 10°C. calculated from those at 25°C. by means of viscosity data, agree with experimental values.

541.135.5 : 621.314.12 : 621.317.725 1192

A practical valve amplifier for measuring glass electrode potentials. LIN CHUN-YU. *J. Sci. Instrum.*, 21, *pp.* 48–49, *March*, 1944.—[Abstr. 933 B (1944)].

541.141 : 539.172 *see Abstr.* 1159

541.144.8 : 547.233 1193

The photolysis of methylamine. WETMORE, O. C., AND TAYLOR, H. A. *J. Chem. Phys.*, 12, *pp.* 61–68, *Feb.*, 1944.—The photolysis of methylamine proceeds essentially by 2 consecutive first-order reactions, the first to produce H_2, NH_3 and CH_2 : NCH_3; the second a dehydrogenation of the latter at a rate approx. double the first. A mechanism involving H atoms is postulated.

541.18 : 539.501 *see Abstr.* 1183

541.182.5 : 576.311 : 537.29 *see Abstr.* 1117

541.182.6.025 : 532.133 *see Abstr.* 1041

541.183.1 : 546.841 : 546.883 : 537.581 1194

Adsorption of thorium on tantalum. GALLAGHER, C. J. *Phys. Rev.*, 65, *pp.* 46–50, *Jan.* 1 *and* 15, 1944.—Th was evaporated from thoriated W on to a well-outgassed Ta ribbon, and the thermionic emission at 1 390°K. was studied as a function of the time of evaporation. The work function of the ribbon changed from 4·07 V to 2·52 V, while emission decreased by a factor of 30. The ribbon was then held at 1 550°K. and the emission from the 2 sides was studied separately. The emission from the activated side decreased, while that of the clean side increased until both reached the same final level after 20 hr.

541.183.7 : 537.36 : 532.613 *see Abstr.* 1047

541.56 : 539.153.4 = 3 *see Abstr.* 1150

541.66 : 536.662 : 547.21 1195

Hyperconjugation in paraffin hydrocarbons. WHELAND, G. W., AND PINKSTON, J. T., JR. *J. Chem. Phys.*, 12, *p.* 69, *Feb.*, 1944.

541.68 : 532.14 : 532.133 *see Abstr.* 1040

545.212 : 621.187.11 1196

Sensitive indicator for volumetric determination of boiler feedwater alkalinity. FLEISHER, H. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 742–743, *Dec.* 15, 1943.

545.32 : 546.56 : 546.72 1197

Determination of copper in cast iron by direct microelectrolysis. MACNEVIN, W. M., AND BOURNIQUE, R. A. *Industr. Engng Chem.* (*Analyt. Edit.*), 15, *pp.* 759–762, *Dec.* 15, 1943.—An investigation of micromethods for the electrolytic determination of Cu in HNO_3 solutions of cast iron, incl. the use of different kinds of apparatus and techniques, the effects of other metals and acids, of insoluble siliceous and graphitic residues, the Mo interference, and sampling error.

545.37 : 621.318.322 1198

Base electrolytes for use in polarographic determinations. WOLFSON, H. *Nature, Lond.*, 153, *pp.* 375–376, *March* 25, 1944.

545.828 : 546.73 1199

Background interference in spectrographic analysis. SCOTT, R. O. *J. Soc. Chem. Ind., Lond.*, *pp.* 25–29, *Jan.*, 1944.—In the spectrographic determination of Co in the cathode layer arc, with iron as the internal std., the effect of background on the slope of the std. curves when evaluation is made by a blackening curve separation method is discussed. M.-V.

545.828 : 546.76 : 546.74 : 669.144.3 : 535.33.03 *see Abstr.* 1074

546.11 : 546.172.6 : 541.127 *see Abstr.* 1187

546.11 : 546.98 : 539.219.1 : 548.73 *see Abstr.* 1204

546.17 : 535.338.4 *see Abstr.* 1079

546.172.6 : 535.338.4 *see Abstr.* 1080

546.172.6 : 546.11 : 541.127 *see Abstr.* 1187

[546.18 + 546.33] : 539.163.2 *see Abstr.* 1154

[546.23 + 546.86] : 539.26 = 3 *see Abstr.* 1170

546.23 : 546.817 : 535.338.4 *see Abstr.* 1081

546.24 : 546.811 : 535.343.4 *see Abstr.* 1084

546.291 : 536.791.2 : 532.62 *see Abstr.* 1049

[546.33 + 546.18] : 539.163.2 *see Abstr.* 1154

546.49 : 535.338.3 = 3 *see Abstr.* 1076

546.49.02 : 535.338.3 *see Abstr.* 1077

546.56 : 546.72 : 545.32 *see Abstr.* 1197

[546.711 + 546.73] : 539.163.2 *see Abstr.* 1155

546.72 : 546.56 : 545.32 *see Abstr.* 1197

[546.73 + 546.711] : 539.163.2 *see Abstr.* 1155

546.73 : 545.828 *see Abstr.* 1199

546.74 : 669.144.3 : 546.76 : 545.828 : 535.33.03 *see Abstr.* 1074

546.76 : 546.74 : 669.144.3 : 545.828 : 535.33.03 *see Abstr.* 1074

546.77 : 539.163.2 : 539.155.2 = 3 *see Abstr.* 1151

546.793.2 : 539.163.2 = 3 *see Abstr.* 1156

546.811 : 546.24 : 535.343.4 *see Abstr.* 1084

546.815 : 539.163.2 = 3 *see Abstr.* 1157

546.817 : 546.23 : 535.338.4 *see Abstr.* 1081

546.841 : 546.883 : 537.581 : 541.183.1 *see Abstr.* 1194

[546.86 + 546.23] : 539.26 = 3 *see Abstr.* 1170

546.883 : 546.841 : 537.581 : 541.183.1 *see Abstr.* 1194

546.94 : 539.163 *see Abstr.* 1153

546.98 : 546.11 : 539.219.1 : 548.73 *see Abstr.* 1204

547.21 : 536.662 : 541.66 *see Abstr.* 1195

547.233 : 541.144.8 *see Abstr.* 1193

547.6 : 535.375.51 *see Abstr.* 1090

548.0 : 535.31 : 539.181 = 3 *see Abstr.* 1160

548.0 : 536.421 = 3 1200

On the behaviour of non-polar crystals immediately below and at the melting point. STRANSKI, I. N. *Z. Phys.*, 119, 1–2, *pp.* 22–34, 1942.—The theory of the equilibrium form of crystals is extended, for the case of non-polar crystals, by taking account of the changes in the crystal structure which cause the crystal to melt. H. G. S.

548.0 : 536.7 : 531.19 *see Abstr.* 1025

548.0 : 539.211 : 553.621 1201

Topography of a quartz crystal face. TOLANSKY, S. *Nature, Lond.*, 153, *pp.* 195–196, *Feb.* 12, 1944.

548.0 : 621.396.621.57 : 534.133 *see Abstr.* 1054

548.24 : 532.782 : 666.942 1202

Dicalcium silicate solid solutions. GREENE, K. T. *J. Res. Nat. Bur. Stand., Wash.*, 32, *pp.* 1–10, *Jan.*, 1944.—Studies on the combination of Na_2O in portland cement clinker have revealed crystalline phases of chemical composition near that of $2CaO \cdot SiO_2$, but possessing properties different from those reported for the β form of this compound. These phases result when certain compositions in the quaternary systems Na_2O-CaO-Al_2O_3-SiO_2 and Na_2O-CaO-Fe_2O_3-SiO_2 are quenched from high temperatures. Optical, thermal and X-ray diffraction data have been obtained which indicate that they are solid solutions of Na_2O. and Al_2O_3 and of Na_2O and Fe_2O_3, in a high-temp. form of $2CaO \cdot SiO_2$ having a hexagonal structure. There is evidence that this hexagonal lattice is the fundamental structure of the α form of $2CaO \cdot SiO_2$.

548.5 : 541.124 : 539.234 = 3 *see Abstr.* 1169

548.7 : 669.14 1203

The interpretation of the crystal structure of cementite. PETCH, N. J. *J. Iron Steel Inst.*, [8 *pp.*],

Feb., 1944. *Advance copy.*—Previous work [Abstr. 2557 (1940)] is extended. The nature of the valency forces in the structure is considered, and it is suggested that cementite is essentially a framework of close-packed Fe atoms held together by metallic bonding, with the small C atoms in the largest interstices, these atoms also being held in position by bonding. This implies a close resemblance to ferrite and austenite. The possibility of variation in the cementite composition is considered, and experimental work on this point is described. Lattice-parameter variations are observed.

548.73: 539.219.1 : 546.98 : 546.11 1204

Solubility of hydrogen in palladium. OWEN, E. A. *Phil. Mag.*, 35, *pp.* 50–57, *Jan.*, 1944.—Investigations by X-ray methods at pressures < 1 atm. and in the temp. range 60° to 130° support the assumptions and formulae proposed by Lacher [Abstr. 3925 (1937)]. There is no evidence of hydride formation; all results point to 2 solid solutions. The hysteresis loops increase in width and in area with rise of temp. contrary to expectations on Lacher's treatment.

N. M. B.

548.73 : 553.621 : 621.39 1205

The use of X-rays for determining the orientation of quartz crystals. BOND, W. L., AND ARMSTRONG, E. J. *Bell Syst. Techn. J.*, 22, *pp.* 293–337, *Oct.*, 1943.—An account of the production and properties of X-rays, their diffraction by crystals, and the essentials of crystallography in so far as the present problem is affected, together with a description of the determination of the orientation of quartz crystals by back-reflection Laue photographs.

J. T.

548.73 = 6 1206

Contribution to the evaluation of the lattice constant by Debye–Scherrer's method. VIERHELLER, F., AND BUENO, A. *Publ. Fac. Cienc. Fis.-Mat. La Plata, No.* 168, *pp.* 345–364, *June*, 1943.—The distance between two corresp. reflection lines is determined by photometry, and the usual choice of wavelength is critically examined. A new method of evaluating Debye–Scherrer photographs is proposed, on the lines of Hadding's method. A corrected sample-diameter is introduced, accounting for excentric placement of the sample with resp. to the cylindrical film. The theory is tested by measurements on Al, Cu, Ag, Pt and Au.

549.211 : 621.92 : 539.211 *see Abstr.* 1163

549.214 : 621.314.632 : 537.311.33 *see Abstr.* 1120

551.506.8 1207

Report on the phenological observations in the British Isles from Dec., 1942, to November, 1943. GUNTON, H. C. *Quart. J. Roy. Met. Soc.* (*Phenol. Rep.*), 70, *No.* 304, [32 *pp.*], 1944.

551.508.5 1208

Portable anemometer. *J. Sci. Instrum.*, 21, *p.* 50, *March*, 1944.—Describes a modification of portable instrument due to Sheppard [Abstr. 2 (1940)].

551.515.11 1

On atmospheric turbulence. OBUKHOV, A. *J. Phys., USSR*, 6, 5, *pp.* 228–229, 1942.

551.593 : 535.663 1

The colours of snowfields in sunlight. MIDDLET W. E. K. *Trans. Roy. Soc. Can.*, 37, *pp.* 39–43, *M* 1943.

551.593.63 : 535.348 *see Abstr.* 1085

553.621 : 539.211 : 548.0 *see Abstr.* 1201

553.621 : 621.39 : 548.73 *see Abstr.* 1205

576.1 : 51 *see Abstr.* 988

576.311 : 541.182.5 : 537.29 *see Abstr.* 1117

576.35 : 512.3 *see Abstr.* 991

576.8.094 : 517.92 *see Abstr.* 999

578.087 : 519.26 1

Mathematics of biological assay. FINNEY, D. GRIDGEMAN, N. T. *Nature, Lond.*, 153, *p.* 2 *March* 4, and *pp.* 461–462, *April* 15, 1944.

578.087 : 519.262.2 *see Abstr.* 1005

591.12 : 531.733 *see Abstr.* 1032

591.18 : 51 *see Abstr.* 989

591.18 : 519.28 *see Abstr.* 1006

591.339 : 532.612 *see Abstr.* 1046

591.477 : 537.3 *see Abstr.* 1118

620.179.6 : 539.211 *see Abstr.* 1162

621.92 : 549.211 : 539.211 *see Abstr.* 1163

629.12.015 : 532.583 *see Abstr.* 1045

629.135.038 : 531.25 = 3 *see Abstr.* 1028

632.94 : 532.62 : 539.217 *see Abstr.* 1165

662.66.094 : 541.128.3 : 541.127.1 *see Abstr.* 1188

666 : 539.4.013 *see Abstr.* 1178

666.1/.2 : 532.13 *see Abstr.* 1039

666.22 : 535.81 *see Abstr.* 1107

666.942 : 532.782 : 548.24 *see Abstr.* 1202

669.14 : 539.382 *see Abstr.* 1174

669.14 : 548.7 *see Abstr.* 1203

669.144.3 : 546.74 : 546.76 : 545.828 : 535.33.03 *see Abstr.* 1074

669.3 : 539.382 *see Abstr.* 1175

669.3 : 621.315.5 : 539.4.016.3 *see Abstr.* 1179

669.71 : 536.7 *see Abstr.* 1112

676 : 539.217.5 *see Abstr.* 1166

677 : 539.62.08 *see Abstr.* 1186

678 : 539.382 *see Abstr.* 1176

744 : 535.317.6 *see Abstr.* 1073

786.6 : 534.321.3 *see Abstr.* 1058